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**Executive Compensation and Corporate Investment
in China: What Determines Them and Are They
Related?**

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Supervisor

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A thesis submitted to Durham University in fulfilment of the
requirements for the degree of Doctorate in Business Administration

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BUSINESS SCHOOL

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Executive Compensation and Corporate Investment in China: What Determines Them and Are They Related?

Abstract

This thesis mainly examines three empirical studies. Firstly, it examines the relation between company ownership attribute and the executive compensation gap between market level and actual level. Secondly, it examines the relation between company ownership attribute and firms' inefficient investment behaviors. Finally, it examines the relation between executive compensation gap, between market level and actual level, and firms' inefficient investment behaviors. Based on Chinese listed companies with data from 2005 to 2012, the thesis finds that: 1) SOE attribute (whether central or local) increases the gap between executives' actual compensation and market determined compensation levels. 2) SOE attribute has a significantly positive influence on a firm's unexpected investment. With other conditions controlled, SOEs invest more than non-SOEs; furthermore, SOE attribute drives firms to make more investments. Meanwhile, although local SOEs invest more than other firms, central SOE attribute does not have a significant relationship to a firm's level of unexpected investment. 3) A significant and positive relation between the extent of compensation regulation and the degree of a listed SOE's overinvestment. These findings reveal that compensation regulation will cause severe agency problems in SOEs. The underpayment of executives in SOEs will not only cause overinvestments but also will devalue firm value of Chinese listed SOEs finally. This thesis contributes to existing literatures by providing a new way to study the correlation between executive compensation and firm investment behaviors. It also provides solid evidence that helps us to understand the consequences of distorted incentive mechanisms in Chinese listed SOEs experiencing government intervention, an issue that has been neglected in previous researches. The implications of this thesis's findings are important to both corporate governance practitioners and policy makers as well.

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Chapter 1: Introduction

1.1 Why this research is important

For many years, the executive compensation of Chinese state-owned enterprises (Hereafter SOEs) has attracted attention from both the authorities and the public.

Some people argue that executives in Chinese SOEs receive compensation that is too high, which is unfair both to other employers and to society as a whole (Gao and Wei, 2014). Since 2010, the Chinese Institute of Economic System Reform has been conducting research on salary and compensation systems in 183 countries and regions. The report concludes that in every country in the world (except for China), government-financed enterprises adopt a public servant compensation standard, and executives at state-financed enterprises receive compensation that is comparable to that received by the country's senior public servants. However, the report also reveals that the average executive compensation in Chinese SOEs is 98 times higher than the Chinese minimum wage; this level of compensation is far higher than the average worldwide compensation of 5 times the minimum wage. Meanwhile, in China such wage difference among different industries is as high as 3000%, far higher than the world's average value of 70%. However, some other scholars argue that if compare the absolute compensation level, executives in Chinese listed firms have much lower compensation than their counterparts in developed economies. For example, Wan et al. (2008) compared executive compensation of publicly listed firms on the Chinese and American stock exchanges and find that in terms of absolute value, executive compensation in American listed firms is about 300 times higher than that in Chinese listed firms.

Since the beginning of the economic reforms in 1978, China's central and local governments have initiated and driven reforms in SOE executive compensation.

Before the economic reforms, Chinese SOEs generally used a rank-based compensation system in which non-managerial employees and plant supervisors are entitled to a particular compensation level based on their technical or administrative rank. The SOE compensation system evolved after the Chinese economic reform. In 1986, the government allowed SOEs to introduce a variety of wage types other than rank-based wages. In the early 1990s, to break the so-called “iron wage and iron bowl” and to motivate SOE employees, the functional wage was introduced. In 1994, an annual compensation package for SOE executives was approved by the government. Before 2001, executive compensation at SOEs was (in general) relatively low; therefore, the government encouraged SOEs to increase executive compensation. Since 2007, however, an increasing number of people have argued that SOE executive compensation is much too high. In 2009, the Chinese government began to take actions to regulate executive compensation in SOEs. Both the central and local governments have released many regulations in the past several years. The most recent compensation regulation pertains to central SOEs and has been valid since January 1, 2015; it will affect the compensation of senior executives in 72 central SOEs. The regulation provides that the total compensation of executives in central SOEs cannot be more than 5 times the average total income of company employees; in addition, it is mandatory to disclose executive compensation.

Another topic that has attracted a great deal of academic attention is that of inefficient investments by Chinese SOEs. Some scholars argue that the imperfect corporate governance of Chinese SOEs leads to inefficient overinvestment. For example, in the past decade, ownership structure (Yuan and Zheng, 1999; He, 2002), management ownership (Liao and Fang, 2004), and blockholder ownership (Ouyang et al., 2005; An et al., 2008) have been extensively discussed. Many other authors focus on the relationship between a firm’s financial condition and its investments. For instance, Feng (1999) reports financing constraints in Chinese listed firms; He (2002) studies the relationship between free cash flow and firm investment; and Tong and Lu (2005) reveal a negative relationship between short-term debt and firm investment.

In general, studies on inefficient investments by Chinese firms primarily focus on agency problems and firms' financial conditions—furthermore, they primarily focus on intrinsic factors. Moreover, most studies merely verify theories that are based on developed economies; they do not consider China's unique political and economic situation.

Chinese SOEs are legally owned by all of China's people. However, because the people have no proper representative, China's central government and its local affiliates are empowered to manage SOEs. From the government's perspective, executive compensation of SOEs is an issue not only of business administration but also (and more importantly) of politics. Because SOE executives normally occupy an administrative rank that corresponds to that of a governor, their compensation is always compared with that of governors.

There have been very limited studies on the relationship between compensation regulation and Chinese firms' inefficient investment. This paper both investigates that relationship and fills the literature gap. The study connects firms' investment behavior and external intervention, and it provides empirical evidence of how firms' investment decisions are influenced not only by corporate governance and financing conditions but also by compensation.

By considering the efficiency of firms' investments, this research also provides a good reference for policy makers when they are crafting compensation policies for executives in SOEs. This paper's findings and recommendations may influence a reform of Chinese SOEs, thus impacting the Chinese economy over the long term.

1.2 Summary: Key findings and contributions

This paper studies the relationship between compensation regulation and the inefficient investment of Chinese listed SOEs.

In the first part of this research, the paper studied the determinants of executive compensation in Chinese listed firms. This paper finds that firm size remains the most important factor in setting executive compensation. ROA is positively but not significantly in all firms related to executive compensation, whereas gross margin is significantly and positively related to executive compensation. This finding shows that to some degree, firm performance influences compensation decisions, but short-term measures (e.g., gross margins) play a more important role in compensation settlement than relatively long-term measures do (e.g., ROA). Corporate governance remains weak in Chinese listed companies. Independent directors are not playing an effective monitoring role in all firms, and CEO duality remains prevalent, which influences executive compensation decisions and causes higher overall compensation. Ownership structure has a significant impact on executive compensation. Consistent with substitute effect theory, the result shows a negative, yet insignificant, relation between management ownership and executive compensation, supporting the argument that management ownership has a substitutive effect on compensation thus the management may accept relatively lower cash compensation. This finding is consistent with some previous studies (e.g., Cordeiro and Veliyath, 2003; Hu et al., 2012) but not with other studies (e.g., Sanders, 2001a; Peng 2006; Zhang, 2010) whose findings support the agency theory and argue that management ownership helps managers influence compensation decisions more effectively so that managers with higher ownership will receive higher compensation. However such relation is not significant in this research which may because management ownership in Chinese listed companies is not prevalent yet. Ownership concentration is significantly and negatively related to executive compensation according to my study and those of other authors (e.g., Ke and Qiu, 2009; Conyon and He, 2011; Zhou, 2013), thus showing that blockholders in Chinese listed companies play an effective role in both monitoring management and controlling executive cash compensation. Another important finding related to executive compensation is the relation between SOE attribute and executive compensation. The paper finds that SOE attribute (whether a company is a central or local SOE) increases the gap between executives' actual

compensation and the market-determined compensation level.

In the second part of this research, the paper investigates firms' inefficient investments. This paper finds that SOE attribute has a significantly positive influence on firms' unexpected investments. The result reveals that under controlled conditions, SOEs make more investments than other firms; furthermore, SOE attribute drives firms to increase their investment. This study also shows that although local SOEs invest more than other firms, central SOE attribute does not have a significant relationship to a firm's unexpected-investment level. The result of empirical study supports the hypothesis that Chinese listed SOEs engage in overinvestment in general. Furthermore, it reveals that although local SOEs engage in overinvestment, central SOEs may not, namely local SOEs may be the primary factor that causes overinvestment in Chinese listed SOEs. This finding is consistent with regression outputs that verify the first Hypothesis in chapter 3 of this thesis, in which the thesis finds that local SOE attribute—not central SOE attribute—can cause a firm to engage in positive, unexpected investments.

The relation between compensation regulation and a firm's inefficient investment is investigated in the third part of this research. The thesis finds a significant and positive relation between the extent of compensation regulation and the degree of overinvestment by Chinese listed SOEs. For those SOEs that do not engage in overinvestment, this thesis finds that compensation regulation decreases a firm's investment. These findings reveal that compensation regulation causes SOEs to experience agency problems. Unlike some other studies (e.g., Xin et al., 2007), this thesis finds a similar relation between compensation regulation and firm investment behavior in both local and central SOEs. Unlike SOEs, non-SOE firms present another relation between compensation regulation and firm investment. In the context of compensation regulation, executives of non-SOE firms choose shirking, whereas executives of SOEs pursue their own interests through overinvestment. This difference reflects the different external political and economic conditions

experienced by SOEs versus non-SOEs, and it provides good support for previous findings that SOEs have much weaker financing constraints than non-SOEs do (e.g., Wang, 2009; Shen et al., 2010).

The thesis introduces a new method to study the correlation between executive compensation and firm investment behaviors which is new to the existing literatures. In the study, the thesis first builds a quantitative model to describe the gap between actual executive compensation and market-determined compensation. Second, the thesis calculates the gap between the two as the measurement of the degree of compensation regulation. Third, the thesis obtains the difference between a firm's actual investment level and its normal investment level, which is the measurement of a firm's inefficient investment. Finally, this thesis checks the correlation between the two gaps mentioned above, finding a significant and positive correlation. This method contributes to the literature on corporate governance and firm investment. Although there have been some related studies on either executive compensation or firm investment, this thesis is among very limited researches (e.g.: Xin et al., 2007) to link executive compensation and firm investment from a compensation regulation perspective in the Chinese political and economic context. Furthermore, this thesis introduces a dynamic panel data model to calculate an executive's market-determined compensation level, an innovation that is novel in the literature.

This study also contributes to the current literature related to compensation management and firms' investment behaviors.

First, the study proves that executive compensation in Chinese listed companies, on certain extent, is below market determined level. Many literatures argue that executive compensations in Chinese listed companies, especially Chinese listed state owned enterprises, are high because of poor corporate governance, government intervene or company ownership structure. For example, Shi (2010) attempts to prove that because in the corporate governance structure of listed SOEs, controlling

shareholders are interlaced with the insiders control and because conflicts between administrative logic and market determining logic in the regulation of executive compensation, the executive compensations in SOEs are out of control and regulations on SOEs' executive compensation are dysfunctional. Jiang (2008) argues that executive compensations in Chinese listed SOEs are much higher than those in private companies, and the growth rate of executive compensation in China is among the highest in the world. Jiang (2008) also claims that regulations on Chinese listed SOEs are generally out of control and distorted. Shen and Li (2010) make arguments based on an empirical study that "pay-for-luck" is pervasive among public firms, and is more severe in SOEs than non-SOEs. The "Pay Ceiling Order", which is originally designed to regulate CEO pay, fails to mitigate the "pay without performance" problem. Based on the background of executive compensation of Chinese listed companies consisting of astronomical salaries and zero pay¹, Yang and Zhao(2012) find that media plays a role in monitoring executive compensation because there are more negative press coverage in the lists of astronomical salaries and zero pay than other lists. The authors further investigate the mechanism under which the media shape its governance role in China, however Yang and Zhao (2012) argue that the media role of monitoring can't improve corporate governance because other surveillance mechanism and reputation system have lapsed so government should release more orders and rules to regulate executive compensations in Chinese listed companies. Although these arguments reveal some problems in executive compensation of Chinese listed companies, they are not the key. Since unique ownership of Chinese public listed companies, especially listed SOEs, there are severe agency problems between executives of Chinese listed SOEs and SOEs' administrative authorities in the government. Due to asymmetrical information, it is very difficult for government to judge executives' behavior, meanwhile, although SOEs introduced independent directors, they are not real "independent" (e.g. Tang et al., 2005; Gao et al., 2006) to monitor executives including compensation setting.

¹ Zero pay refers to the phenomena that in China, some chairmen or top executives of Chinese listed firms give up their wages or only receive a very low compensation from the companies. Ding (2007) gives a deep study on this.

Thus to keep a “fair” compensation for executives in SOEs, government merely issued many “Pay ceiling order” and all kinds of regulations. This study, however, shows that underpayment is prevailing among Chinese listed companies, particularly listed SOEs. The study finds that 48.37% of executives in Chinese listed SOEs are underpaid when use all listed companies as the benchmark of market compensation level; 51.83% of executives are underpaid when use all non-SOEs as the same benchmark. This finding is valuable. It clearly shows that although some executives are overpaid in SOEs, many more are underpaid. So scholars and administrative authorities should focus more on how to motivate executives in Chinese listed SOEs rather than merely regulate executives’ compensation to cater to public’s appeal of fairness.

Second, this study provides solid evidence that helps us to understand the consequences of distorted incentive mechanisms in Chinese listed SOEs experiencing government intervention, an issue that has been neglected in previous researches. The study reveals that executive compensation (and the regulation of such compensation) can influence firms’ investment behaviors under the Chinese political and economic context. Only very few literatures studied relation between executive compensation and firm’s investment. For instance, Chen and Sun (2014) studied correlation between executive compensation and firm investment behavior of Chinese listed companies from 2009 and 2011. They argue that there is a significant relation between executive compensation and firm investment, furthermore they point out that such relation varies with different company ownership: no significant relation is found between executive compensation and firm investment in listed SOEs whereas such relation still remains significantly positive among non-SOEs. Based on dynamic panel data model, Xia and Yu (2012) studied Chinese listed companies from 2004 to 2010 and find that improper pricing of executive compensations and stocks have influence to firm’s investment. Xin et al. (2007) argue that low executive compensation in local Chinese SOEs will cause overinvestment but compensation contract failure does not cause agency problems in central SOEs and non-SOEs. Xu and Liu (2014) studied executive

compensation and firm investment from an endogeneity perspective. They find that higher level of corporate investment leads to a significant reduction of executive compensation. Executive compensation contracts based on accounting performance can not improve the level of long-term investment thus executive compensation has negative effect on the corporate investment. They argue that executive incentives of Chinese listed companies have no effect to solve the agent problem of corporate investment. In summary, previous literatures haven't reached a well-accepted conclusion of relation between executive compensation and firm investment under Chinese political and economic context. This vagueness brings obstacles to innumerable previous researches and future studies as well. Almost all existing researches did not consider the impact from executive compensation when study firm's investment behavior. This thesis aims to bring more knowledge to this filed by answering the relation between executive compensation and firm investment in a more quantitative and structural way. The thesis finds that there is compensation regulation in listed SOEs, which results in actual executive compensation that is lower than the market-determined level. Due to the compensation regulations, there is overinvestment in Chinese listed SOEs. The thesis also reveals the different agency problems in SOEs and non-SOEs. When underpaid, executives in SOEs will make overinvestment so as to gain additional benefits while executives in non-SOEs will choose underinvestment with shirking. This thesis not only enriches the existing literatures about executive compensation and firm investment, it also provides strong empirical evidences to support agency theory in corporate finance field. Meanwhile, the thesis indicates that the investment models adopted by the previous literature are insufficient in that they ignore the influence of compensation incentives. Therefore, this study provides a new understanding of the investment behaviors of Chinese listed firms which will bring valuable hints to future researches in the field related to executive compensation and firm investment.

This research also presents a good reference for business administration practitioners and provides authority for the creation of executive compensation schemes. Chinese

government released several compensation regulations in the past years. The latest order was launched at the beginning of 2015². The press release on the Chinese government website states the purpose of this order that “From China's basic national conditions, adapt to the process of State-owned assets management system and the reform of State-owned enterprises, gradually standardized enterprise income distribution in order to achieve appropriate levels of pay, reasonable structure, management, oversight and effective, and make adjustments to the unreasonably growing higher and higher incomes...to realize rational income distribution relationship between executives and employees, properly regulate the industry pay gap between business leaders and promote social equity and justice; adhere to combination of government regulation and corporate self-discipline, improve supervision of central compensation system, regulate the order of income distribution.” The new release shows that China government believes executive compensation in central SOEs is abnormally high which has already hurt social fairness and justice. Thus in some extent, the executive compensation regulation released by China government is more for political reasons rather than considerations from corporate governance perspective. This thesis brings evidences to China government that their regulations to executive compensation in SOEs may not be correct and will bring negative consequences to SOEs’ corporate values. As said, the thesis has three key findings: firstly, there is compensation regulation in Chinese listed SOEs; secondly, in general, Chinese listed SOEs have overinvestment; and thirdly, compensation regulations in Chinese listed SOEs cause overinvestment while in listed non-SOEs cause underinvestment. The findings reveal that regulations on executives’ compensation in SOEs cause firm’s overinvestment, and the over investment consequently leads negative impact to firms’ value (e.g. Morgado and Pindado, 2003; Jiang, 2011; Du et al., 2011; Khieu et al., 2012). This study indicates that compensation regulations in Chinese listed SOEs bring severe side effects and will

² Please refer to:

http://www.gov.cn/xinwen/2014-08/29/content_2742373.htm

http://www.cssn.cn/dzyx/dzyx_jlyhz/201501/t20150104_1464858.shtml

<http://gd.sina.com.cn/fs/2016-04-27/city-fs-ifxrpvcy4534238.shtml>

furtherly diminish state-owned assets. This implication is critical: it may influence China government to reconsider future reform actions in Chinese SOEs and will ultimately impact China's political and economic ecology in a long term.

1.3 Theoretical framework and literature review

Because executive compensation in Chinese SOEs is regulated, the executive compensation of SOE managers is below market level. Moreover, SOE executives normally either do not receive equity-based incentives or receive only very weak equity-based incentives, which cannot offset the gap between their compensation and executive compensation in private companies (Wang and Tang, 2014).

Underpayment of executive compensation causes serious agency problems in Chinese listed SOEs. According to classic agency theory, agency issues appear when the interests of a firm's managers are different from those of the firm's owners. In those situations, managers will demonstrate a preference for on-the-job perquisites, shirking, or making self-interested and entrenched decisions that reduce shareholder wealth (Jensen and Meckling, 1976). Gomez-Mejia and Wiseman (1997) also argue that agents behave to maximize their own interests and that agents' interests are normally different from principals' interests. Because SOE executives are underpaid, they will find ways to offset their losses, thus causing agency problems.

Additionally, asymmetric information between principals and agents in Chinese SOEs aggravates agency problems. Absentee ownership is a prominent problem in Chinese SOEs. Legally, SOEs are owned by the state. In practice, however, central government departments and local governments are entrusted to supervise SOE management. Currently, these supervisors are the SASACs (State-owned Assets Supervision and Administration Commission of the State Council) of governments at various levels. The problem is that SASACs are not the true owners, and therefore, their officials do not have adequate incentives to supervise SOE management. In such situations, SOE employees who conduct the SOE's day-to-day management hold

much more information than the government does. This inside information enables SOE executives to make managerial decisions that serve their own interests.

That notwithstanding, a firm's investment policy is highly dependent on both its growth opportunities and its financial condition. Fazzari, Hubbard, and Petersen (1988) (FHP) find that higher investment sensitivity to cash flow availability is found in companies with lower dividend payment ratios; the authors interpret this finding as an evidence of financing constraints. Follow FHP (1988)'s study, many scholars (e.g. (Hubbard et al., 1998; Degryse and Jong, 2001; Gelos and Werner, 2002) introduced different methods to measure financing constraint and proved investment sensitivity under financing constraint. Luo et al. (2012) argue that although bank credit significantly boosts firms' overinvestment in Chinese SOEs, it does not have a significant influence on private firms' investment decisions. This finding reveals variations in the efficiency of financing among enterprises with different types of ownership. Although some scholars (e.g.: Lin and Bo, 2012; Firth et al., 2012) argue that state ownership does not necessarily help in reducing the firm's financing constraints on investment and that state ownership does not lead to more borrowing from the Chinese banking sector, they do not partition Chinese SOEs into central SOEs and local SOEs in the study which causes their conclusion questionable. Meanwhile, many other scholars report that Chinese central SOEs and local SOEs do not rely on the same financing channel. For example, Ju (2013) finds that Chinese central SOEs more rely on loans from banking sector to support their innovation investments while local SOEs and non-SOEs do not rely on external financing too much for the same investments. He and Yang (2012) study the different effect of accessibility of funds on productivity between state owned and private owned firms. The authors find that the productivity of listed firms as a whole is not influenced by the internal finance; if the firms are split into two subsamples by state-owned and private-owned ones, only private-owned firms suffer from financial constraint. Fang et al. (2014) document that SOEs normally have higher ratio of debt and actually Chinese SOEs have very weak financing constraints compared with private

companies. Some scholars have investigated firm overinvestment behavior related to the influence of government intervention. Xiang et al. (2014) find that at the initial stage of a local governor's incumbency, intervention in local SOEs is small, and therefore, local SOEs' overinvestment is also weak; the longer that a local governor is incumbent, the higher the level of intervention in local SOEs is, which results in a more severe overinvestment. However when a local governor is going to step down from the position, the magnitude of overinvestment drops dramatically. Wu and Yu (2009) report that overinvestment is much more serious in local SOEs than that in local private companies and argue that local government intervention aggravates firms' overinvestment. Zhang et al. (2014) also document the positive relation between government intervention and firm overinvestment and further note that diversification is one important type of overinvestment in firms, especially in SOEs.

SOE investment inefficiencies arising out of conflicts of interest and asymmetric information cannot be thoroughly resolved under the current system. Because of agency problems caused by executive compensation regulations and weaker financing constraints in Chinese SOEs, overinvestment is a common choice made by SOE executives that allows them to advance their own interests. On the one hand, executives can obtain additional benefits from investment projects. At the same time, overinvestment normally increases firm size, which will bring executives more power and higher compensation because firm size is the one of the most important determinants of executive compensation (Robert, 1956; Ciscel and Carroll, 1980; Tosi, Werner et al., 2000).

In summary, this thesis would argue that executive compensation regulation causes severe agency problems in Chinese SOEs. In addition, because Chinese SOEs normally do not have financing constraints, executives of Chinese SOEs choose to overinvest to serve their own interest in compensating themselves for the income loss caused by compensation regulations.

1.4 Research design

The purpose of this thesis is to investigate the correlation between compensation regulation and Chinese listed SOEs' inefficient investment. The study is divided into three steps.

The first step investigates compensation regulation in Chinese listed firms. In this step, this thesis constructs a market-oriented compensation model as the benchmark. Based on this benchmark model, the thesis then predicts each firm's market-level executive compensation. The difference between market-level compensation and actual compensation can be obtained. A regression containing this difference and an SOE attribute dummy variable are conducted to check whether there is an SOE compensation regulation.

The second step examines firms' investment behaviors. The thesis refers to Vogt's (1994) model to check the sensitivity between a firm's investment and its free cash flow to verify whether there is overinvestment by Chinese SOEs. This thesis also calculates the extent of the firm's inefficient investment. Based on a model similar to Richardson's (2006) method, the thesis builds a model to describe the firm's expected and unexpected investment levels. The sign of the unexpected investment level denotes whether the firm is overinvested (i.e., the sign is positive) or underinvested (i.e., the sign is negative); the absolute value of the unexpected investment reflects the extent of over- or underinvestment. A regression containing both unexpected investment and the SOE dummy variable is performed to check whether the SOE attribute drives a firm to invest more.

In the third step, the thesis investigates the relation between compensation regulation and firms' overinvestment. In the first step, this thesis has obtained the difference between market-oriented compensation levels and actual compensation levels; in the second step, the thesis has uncovered the amount of firms' unexpected investment. In

the third step, the thesis checks the correlations between the findings from the first two steps. To do so, a regression composed of the compensation gap and firms' unexpected investment is conducted, and a positive relation between a compensation gap and firms' unexpected investment is expected.

1.5 Thesis structure

There are five chapters in this thesis. In the first chapter, this thesis introduces the research background, a brief research framework, and the research design. In the second chapter, the thesis discusses compensation regulation in Chinese listed SOEs. The third chapter focuses on firms' investment behaviors and determines whether SOEs engage in more investment than private firms. In the fourth chapter, this thesis closely investigates the relation between compensation regulation and firms' overinvestment. In addition, the fifth chapter provides a conclusion and a discussion of future studies.

1.6 Introduction on Sample Data-setting

As mentioned in section 1.5 above, there are 3 empirical studies in this thesis. The first empirical study is conducted in chapter 2 focusing on relation between firm attribute and executive compensation gap. The second empirical study is deployed in chapter 3 investigating the relation between firm attribute and firm's inefficient investment. The third empirical study is in chapter 4, trying to figure out the relation between firm inefficient investment and executive compensation gap.

Three empirical studies use the same data set in sequence. The detailed description of data setting is as follows.

1.6.1 Data set of Chapter 2

Chapter 2 aims to investigate the relation between firm attribute and executive

compensation gap between market-determined executive compensation level and actual compensation level. To deploy the study, the thesis first constructs a market compensation model to determine executive compensation level. The samples include non-financial companies listed on both the Shanghai Stock Exchange and the Shenzhen Stock Exchange. Financial companies are excluded from the sample because the executive compensation characteristics of financial organizations are very different from those of non-financial companies given the stricter compensation regulations that apply to financial organizations (Firth et al., 2007). The thesis chooses A-share data only because B-share stocks are traded in USD by qualified foreign investors and their total market value is small. The data of this thesis are from 2005 to 2012. The starting year is the year of China's official launch of split-share reform (Zheng et al., 2007). The "Split Share Structure Reform" in China enables state shareholders of listed companies to trade their restricted shares. This renders the wealth of state shareholders more related to share price movements and this reform will create remuneration arrangements that increase the relationship between Chinese firms' executive pay and stock market performance (Hou et al., 2013). Furthermore split share reform motivates state-controlled firms and especially those where dominant shareholders to have greater incentives to improve share return performance and corporate governance (Liao et al., 2008). That said split share reform significantly influences corporate governance (Wang et al., 2010) and agency problems (Tseng, 2012) which also largely influences firms' investment behaviors (e.g.: Li, 2008; Huang et al., 2011; Qiang, 2012). To eliminate split ownership impact to executive compensation and firm investment behaviors, this thesis chooses data after 2005 when split share reform was implemented. The thesis also deletes all firm-year observations with negative operating income per share or negative total assets from the sample to remove firms who do not have normal business operations or who are in bankruptcy.

Executive compensation information can be obtained from listed companies' annual reports, as the Chinese CSRC has required all listed companies to disclose information about top management's compensation since 1998.

In the first research, the dependent variable is total cash compensation of all of the executives disclosed in each firm's annual reports. The independent variables are accounting items, corporate governance-related data, and basic company information such as company age, industry attributes, etc. All of these data can be obtained from CSMAR data. Because some items are missing from the CSMAR data, the size of the total samples is somewhat reduced from original amount. Following a necessary data trim, the samples for the executive compensation regulation study contain data from 1,481 companies and include 12,260 firm-year observations. The panel data is unbalanced. The number of observations in each year varies from 1177 in 2005 to 2220 in 2012.

1.6.2 Data set of Chapter 3

Chapter 3 discusses the determinants of firm's investments and checks the relation between firm attribute and firm's inefficient investments. There are two empirical studies in Chapter 3 to check two hypotheses. The first hypothesis is to check whether firm attribute is related to firm's inefficient investments and the second hypothesis checks whether Chinese SOEs are, in general, overinvested.

As in the previous study, the samples in Chapter 3 include non-financial companies of A shares listed on both the Shanghai Stock Exchange and the Shenzhen Stock Exchange from 2005 to 2012. Financial companies are excluded from the sample because their assets and financing situations are very different from those of non-financial companies. Again, the thesis also deletes all firm-year observations with negative operating income per share or negative total assets from the sample to remove firms who do not have normal business operations or who are in bankruptcy.

To check the hypotheses in this chapter, the thesis uses many accounting items such as Tobin's Q, cash flow, fixed assets, cash stock, annual revenue, and financial leverage etc. All of these data can be obtained from the CSMAR database. One year

lagged data are required in the regression to check hypotheses. So although the raw data in chapter 3 is from 2005 to 2012 with the same number as that in chapter 2, the number of data in the regressions is much less due to one year lagged variables are required, namely one year data are lost.

Thus, the number of samples (firm-year observations) for the first empirical study in Chapter 3 becomes 9897. To check the second hypothesis in chapter 3, this thesis conducts four regressions. The first regression is conducted on the samples including all firms, the second regression is conducted on the subsamples including all SOEs, the third regression is conducted on the subsamples including all local SOEs and the fourth regression is conducted on the subsamples including only central SOEs. Obviously, the number of samples for these regressions becomes smaller and smaller. Sample number of the first regression is 9897, that of the second regression is 5297; the third regression contains 4622 samples while the last regression only has 675 samples.

1.6.3 Data set of Chapter 4

In this section, the thesis examines the relation between compensation regulation and firms' overinvestment. The study begins based on previous sections of this thesis. In Chapter 2, this thesis finds that because of compensation regulation, executive compensation in Chinese listed SOEs is below the market level. The thesis obtains the gap between the market-determined compensation level and actual executive compensation in Chapter 2. Meanwhile, the thesis investigates firms' investments in Chapter 3 and finds that, in general, Chinese listed SOEs are overinvested; the degree of overinvestment is obtained, which represents the unexpected part of a firm's investment. The unexpected part of firms' investment will be dependent variables of the regressions in this chapter. So the number of samples in this chapter is same as that in chapter which is 9897.

To check the relation between compensation regulation and firms' overinvestment in details, besides all firms with 9897 observations, the thesis partitions the samples into several subgroups as non-SOEs, all SOEs, local SOEs and central SOEs. The number of these subsamples are 4597, 5297, 4622 and 675 respectively.

Chapter 2: Executive Compensation in Chinese Listed State-Owned Enterprises

2.1 Abstract

This chapter examines compensation regulations in Chinese listed firms. The thesis finds that firm size, ROA, and gross margin are positively related to executive compensation. Ownership structure has a significant impact on executive compensation, with ownership concentration significantly and negatively related to executive compensation. An important finding related to executive compensation is the relation between SOE attribute and executive compensation. This thesis finds that SOE attribute (whether central or local) increases the gap between executives' actual compensation and market-determined compensation levels, which reveals the existence of compensation regulation in both central SOEs and local SOEs.

2.2 Introduction

2.2.1 Background and rationale

This chapter investigates whether the regulation of executive compensation exists in Chinese public companies. The thesis first constructs a market-oriented executive model based on all listed companies and then uses that model to create expectations about the executive compensation paid by each company. To verify whether there is compensation regulation at listed companies, the thesis calculates the gap between each company's expected compensation level and real executive compensation. If the gap is positive, there is compensation regulation, whereas if the gap is negative, executive compensation is higher than market level, indicating that the company does not have compensation regulation. Although the gap indicates the presence of compensation regulation, the absolute value of the gap can also show the degree of compensation regulation or overly high compensation.

The study in this chapter checks the compensation regulation status of listed companies while providing the necessary data for the study that will be described in Chapter 4. The thesis investigates the relationship between executive regulation and firm overinvestment; to do so, it uses the executive compensation gap obtained in this chapter.

2.2.2 Specific purpose

This chapter's goal is to identify executive compensation regulation in Chinese public companies.

Specifically, this chapter does the following:

- It builds a market-determined executive compensation model;
- It creates expectations about executive compensation based on a market-oriented executive compensation model;
- It calculates the gap between expected executive compensation and real executive compensation from the CSMAR database; and
- It identifies whether there is a positive relationship between SOEs and executive pay gaps.

2.2.3 Definitions and units of analysis

In this chapter, the thesis investigates executive compensation in Chinese listed companies. The definitions of executive and compensation are illustrated below.

-The definition of executive

Many empirical studies of executive compensation use CEOs to represent executives and assume that the design and consequences of a company's compensation scheme have the same effect on CEOs as they do on other high-level executives (Carpenter and Sander, 2002). However, Chinese SOEs have a unique ownership structure in

which the board chairmen normally do not own the company but instead work for the state as do CEOs. Additionally, Liu (2015) reports that the average rate of CEO duality in Chinese listed companies is 24%, which is considerable, and SOEs are more likely to have CEO duality. Therefore, it is questionable to use CEO compensation as a proxy for executive compensation generally. In this research, the thesis uses the compensation of all of the top executives disclosed in a firm's annual report; the thesis does not include the compensation of outside directors and members of the board of supervisors.

-The definition of compensation

In practice, there are four components of executive compensation (Conyon, 2006): base salary, annual bonus, stock options, and additional compensation such as long-term incentives and retirement plans. Some scholars (e.g., Jensen and Murphy, 1990a, 1990b) categorize executive compensation as salary, bonus, deferred remuneration, stock options, and total compensation. Among these four components of compensation, salary, bonus, and deferred remuneration are cash compensation and normally short term, whereas stock options are equity based and long-term. Although equity-based compensation has recently become more important, it is very difficult for us to evaluate the market value of stock options in the Chinese market. Additionally, Li et al. (2013) have analyzed 228 executive compensation contracts from Chinese listed companies between 2004 and 2010 and find that cash-based payments remain the primary form of executive compensation and that equity-based payment is seldom adopted by Chinese listed companies. Another finding of this research is that normal compensation consists of basic salary and performance-based payments; few companies have introduced stock-based compensation.

For the above reasons, in this research, the thesis uses only executives' cash compensation as the dependent variable. According to Chinese Securities Regulatory Committee (CSRC) requirements, Chinese listed companies must disclose cash compensation, including base salary, bonus, benefits, allowances, and all types of

subsidies. This thesis creates a logarithm of total cash compensation from firms' annual reports as our data for the research.

2.2.4 Key findings

In the section, the thesis finds that SOE attribute (whether central or local) increases the gap between executives' actual compensation and market-determined compensation levels. The finding supports the hypothesis that executive compensation in SOEs is regulated and is lower than market level.

2.3 Literature review

2.3.1 Theoretical perspective

Over the past 50 years, there have been numerous academic studies on executive compensation. In those studies, approximately 16 theories have been discussed, which can be categorized into 3 theoretical approaches (see, e.g., Gomez-Mejia, 1994; Balsam, 2002).

The first approach is value matching, which focuses on the question of how much to pay executives. Theories that adopt this approach attempt to argue that executives' compensation is determined by their value; furthermore, executive compensation is equal to the market value of an executive's services to the firm.

The second approach is agency, which considers how to pay executives in a manner that mitigates agency problems. This approach studies the structure and level of compensation as an instrument in agency problems.

The third approach is symbolic reflection, which considers compensation as a reflection of executives' status, achievement, or esteem. According to this approach, status is reflected by compensation level, which motivates executives to perform

better.

2.3.1.1 The value-matching approach

The value-matching theories generally regard compensation as the market value of an executive's services. The fundamental principle of value matching is the economic law of supply and demand, which determines the factors that contribute to executive compensation.

Marginal productivity theory is considered the most basic value-matching argument. Executives' services are treated as one of the input factors of a firm's production (Robert, 1956). The valuation of this input is determined by supply and demand in the labor market. Simultaneously, compensation is equal to the executive's marginal revenue contribution, which can be described as the gap between the firm's measured current performance and its best possible future performance if it is led by alternative executives (Gomez-Mejia, 1994). One prerequisite of the above rule is that the labor market should be free and effective with respect to both executives and firms. Executives can find and work for potential employers in the labor market, and firms can find appropriate executives from the labor market when needed (Robert, 1956). Based on that assumption, executive compensation can be treated as the equivalent of executives' marginal revenue contributions to their firms.

Other theories, such as human capital theory, argue that an executive's revenue contribution is influenced by his or her personal capabilities, including knowledge, skills, and experiences. Personal capabilities can also be called human capital. This theory argues that the more knowledge, skills, and experiences—furthermore, the more human capital—that an executive has, the better his or her job performance is and, consequently, the higher his or her compensation is. An executive's human capital is valued in the manager market, and this value is typically equal to the

executive's compensation (Agarwal, 1981; Harris and Helfat, 1997; Combs and Skill, 2003).

Some scholars (e.g., Lazear, 1995; Prendergast, 1999) extend human capital theories to argue that if an executive is given or promised above-market compensation, he or she will make an extra effort to improve his/her personal performance and, thus, the firm's performance. This relatively higher compensation level not only encourages executives to pursue better performance but also attracts executives to serve their firms longer, thus decreasing turnover and increasing firm productivity (Balsam, 2002). In this situation, an executive's compensation equals the sum of his/her marginal revenue contribution and a compensation surplus over the average compensation level in the market.

Gomez-Mejia and Wiseman (1997) and Thomas (2002) argue that if there is an effective and free labor market for managers, an executive will have the ability to find a potential employer and change his/her job. To retain their executives, firms should provide compensation that is at least equal to the highest compensation that alternative employers in the market are willing to offer.

The distribution of executive compensation is skewed (Rosen, 1981), an observation that can be explained by superstar theory. Rosen (1981) argues that less-talented executives cannot substitute for more-talented executives in terms of job performance, and therefore firms' demand for more-talented executives increases disproportionately in the labor market for managers. Because the supply-and-demand relationship is different for more-talented versus less-talented executives, firms are willing to pay disproportionately higher compensation to more-talented executives. This result subsequently changes the distribution of executive compensation in the manager labor market and shows that more-talented executives receive higher compensation.

2.3.1.2 The agency-problem approach

According to classic agency theory, agency issues appear when the interests of a firm's managers (agents) are not in line with those of the firm's owners (principals). Therefore, the managers will form a preference for on-the-job perquisites, shirking, or making self-interested, entrenched decisions that reduce shareholder wealth (Jensen and Meckling, 1976). The severity of the agency issue can be limited by how well owners and other delegated third parties—i.e., banks or creditors—either monitor the actions of outside managers or motivate those managers, thus aligning managers' benefits with company interests.

In a simple agency model, three basic assumptions are adopted, as posited by Gomez-Mejia and Wiseman (1997). The first assumption defines agents as risk averse, the second assumption states that agents behave to maximize their own interests, and the third assumption indicates that agents' interests are typically not in line with the interests of their principals.

Based on the above assumptions, it is necessary to further discuss two conditions. In the first scenario, we assume that there is no information hidden from either agents or principals. In this case, both agents and principals are exposed to equal and transparent information, which means that principals know their agents' actions and the results of those actions; moreover, agents understand their principals' attitudes toward their actions. Because both sides possess symmetric and equal information, it is unnecessary to provide agents with additional incentive schemes to motivate them to consider their principals' interests. In the second scenario, however, the information available to principals and agents is not equal and asymmetric. In this case, because principals' information is incomplete and they are not fully aware of whether their agents are deviating from their interests, agency problems may occur. There are several possible reasons for this result, including the following: (1) hidden information, i.e., the adverse selection problem, and (2) hidden actions, i.e., the moral

hazard problem, which refers to a situation in which an agent pursues his/her own interests while neglecting or even acting contrary to the principal's interests.

Adverse selection describes situations in which executives have intentionally hidden useful information when their firms design compensation contracts so that those executives can obtain personal advantages in the future. This hidden information can be generated in the following situations: (1) situations involving privileged information about a firm's environment; and (2) situations in which executives are market and industry experts and shareholders cannot evaluate their capabilities or motivations. In general, hidden information refers to situations in which the price that shareholders have to pay to obtain information is higher than the information's possible benefits.

Hidden actions are normally referred to as a moral hazard, i.e., the situation in which the agent performs actions that influence another party (namely, the principal), but the principal cannot observe the agent's actions (Katz and Rose, 1998).

For example, agents can drive a company to expand revenue instead of increasing profits or declining to take action when there is a good investment opportunity (we can identify these opportunities because NPV is positive) solely because they want to remain secure in their current positions. Principals have two options for solving this asymmetric information problem. One option is to obtain more information about agents' behaviors, actions, and efforts through controlling and monitoring. Another option is to motivate agents to align their interests with those of their principals. Because agents are risk averse, when incentives are deployed, they are going to compare their alternatives based on their own maximum potential payback. If the incentive is sufficiently large to exceed the possible gain realized when an agent chooses to serve only his own interests, then agents will choose to benefit from the incentive scheme to realize the relatively larger incentives. Simultaneously, principals' interests are well served because the results of incentive schemes and the principals'

interests are normally bound together when an incentive scheme is designed. However, when executive compensation is designed, a conflict is often created when attempting to optimize incentives from the principal's side and risks from the agents' side (Rajagopalan, 1997). If executives have information that shareholders do not have, then shareholders bear the risk that the executives will not inform them (or will only partially inform them); this risk will influence executive compensation (Goldberg and Idson, 1995).

The moral hazard problem can also be described as a double moral hazard problem. Gupta and Romano (1998) argue that in a production process involving two parties, because those two parties cooperate to complete the process, it is difficult to evaluate what contribution is made by each party, and each party has the ability to engage in some actions that are not observed by the other party.

A significant number of methods have been identified to reduce agency problems between executives and shareholders. Agrawal and Knoeber (1996) note that useful tools for combating agency problems include the existence of institutional investors or a large number of block holders, the presence of outside directors on the board, firm debts, an effective managerial market and a market for corporate control. Burns and Kedia (2006) argue that the use of stock options is also a good way of aligning the interests of executives and shareholders. Some other scholars, including Ang et al. (2000), have discussed the relationship between agency costs and various types of ownership and management structures.

One important mechanism to reduce agency costs, as mentioned above, is the existence of institutional investors or block holders. Institutional investors and block holders will be more effective than individual shareholders when protecting their own interests because their ownership stake is larger. Therefore, they have a more powerful motivation to monitor executives' behavior; in addition, they have more power to conduct such monitoring. Such investors will also exercise more control

over executives' actions and attempt to avoid increasing executive compensation. Furthermore, institutional investors are more likely to choose companies in which the relationship between executive pay and firm performance is strong (Hartzell and Starks, 2003).

Another mechanism that reduces agency costs is the introduction of outside directors to the board. Many theories argue that executives who serve on either the board or the compensation committee will attempt to extract personal benefits in terms of their compensation. Anderson and Bizjak (2003) argue that executives who serve on the compensation committee will not experience decreased personal compensation, even if they leave the committee. Hallock (1997) reports that if executives serve on two boards simultaneously, they can not only positively influence their personal compensation level but also obtain relatively more compensation than executives who do not serve on two boards simultaneously. Therefore, some scholars such as Borokhovich et al. (1997) argue that one way to decrease agency costs is to have more outside than inside board members.

Many authors also consider debts such as bank loans to be an option for reducing agency costs (e.g., Almazan and Suarez, 2003; Elston and Goldberg, 2003). Almazan and Suarez (2003) argue that executive compensation should be defined by three essential factors—firm performance, bank loans, and incentive levels—that can effectively motivate executives. When a bank offers a loan, it frequently monitors executives' actions to guarantee both that the firm is properly using the loan and that the firm has sufficient money to repay the loan. In addition, to ensure that the firm has the money to make repayment, the bank will insist that the firm's executives not receive high compensation.

Osano (2002) has also studied the relationship between executive compensation and bank loans. This author argues that one interesting way to decrease bank loans while increasing the bank's market value is to grant executives stock options because they

will attempt to increase the bank's market value and exercise their stock options to extract personal benefits.

The managerial labor market provides another way to reduce agency costs related to executive compensation. Executive compensation should reflect knowledge, capability, and experience, and it should be benchmarked by the workers who hold the same status in the market. If many workers in the labor market have similar levels of knowledge, capability, and experience, a firm's executives normally ask for relatively lower compensation because they know that many outside managers want their jobs and can replace them. If executives have unique skills shared by few people in the market, they are more likely to require higher compensation because of the low risk of being replaced by outside managers. Murphy (2003) argues that if large companies compete for high-caliber executives, their executive compensation contracts will force competitors to offer similar compensation contracts so that they can attract the best candidates.

The market for corporate control is also defended as a mechanism that both aligns executives' and shareholders' interests and reduces agency problems. Agrwal and Knoeber (1996) argue that if executives are not monitored by the external corporate-control market, they probably will extract higher-than-normal compensation. Rajan and Wulf (2006) show that high external monitoring and fear of takeover by external buyers will drive shareholders to manage executive compensation and on-the-job perks to avoid the acquisition and replacement of both shareholders and incumbent executives.

The use of stock options has reportedly reduced agency costs because it forces executives to report firm's performance to investors properly (Kedia, 2006). If executives receive a considerable portion of their compensation from stock options, they will make their best efforts to increase company market value so they can extract their personal interests from the price of company stock. However, Ofek and Yermack

(2000) argue that if executives are given too many stock options that exceed what they want, shareholders will diversify their personal investment portfolio by selling stock options they already owned to the level in order to motivate executives to increase firm performance.

The problem with stock options relates to how executives can increase the stock price to the level at which they can exercise their options. Executives occasionally manipulate a firm's accounting to influence stock price by releasing positive information; these situations are more common when CEO compensation is based on stock price (Bergstresser and Philippon, 2006). Many authors (e.g., Narayanan, 1999; Hu and Noe, 2001; Povel et al. 2007) also report that executives intentionally choose the time at which they send positive information to the market; this happens more frequently when the market situation is good. Lowry and Murphy (2007) show that executives can influence the offer price and the timing of a firm's IPO.

Some scholars (e.g., Bernardo, Cai and Luo, 2001; Bernardo, 2004) focus their attention on the agency problems associated with division managers. Division managers sometimes push CEOs to increase their future compensation when their projects exceed the firm's expectations. Barron and Waddell (2003) note that senior executives receive more performance-based compensation than middle level managers do; moreover, senior executives also have a greater influence on the stock price. Goldman (2004) argues that agency problems will happen when the budget is defined by senior executives and cascades down to firm departments and middle and front-line managers. The possible reason for this argument is that because CEOs' personal interests are closely intertwined with stock price, when CEOs distribute budget monies to various departments, they will favor those departments that can guarantee improved firm performance and thus increase the firm's stock price.

Based on the asymmetric information problem, Aboody and Lev (2000) argue that the R&D department is one of the biggest sources of agency problems. These authors

argue that because of the complexity and professionalism of R&D, researchers have more information than anyone else in the company, occasionally even including CEOs. Moreover, they know the impact that ongoing projects have on the firm's performance, so they can buy firm stock in advance if they believe that their projects will increase the firm's future stock price.

Some theories that adopt this approach, including the contracting theory (Jensen and Meckling, 1976), consider executive compensation to be a solution to mitigate agency problems. Other theories consider executive compensation to be related to executives' bargaining power in the principal/agent relationship. They argue that executives have favorable positions from which to set their own compensation (Bratton, 2005)

Contract theory dominates the executive-compensation literature (Bebchuk and Fried, 2004). Gomea-Mejia and Wiseman (1997) argue that the central issue in contract problems involves balancing the weight of insurance versus incentives in compensation design, thus reflecting the tradeoff between the cost of monitoring agent behavior on the principal side and the cost of transferring risk to the agent. Essentially, contract theory treats executive compensation as an instrument to align the interests of executives with those of company shareholders. Based on a contract between the principal and the agent, incentives are designed to transfer risks back to the risk-averse executives. In a simple model of this contract, executive compensation should be equal to the amount that motivates risk-averse executives to behave based on their own interests, whereas executives' behavioral outcomes are in line with shareholders' interests. In such situations, the contract is typically made between the board of directors, which represents the shareholders, and the management team. Compensation is based on the market value of the executives' services and the costs of various types of monitoring. Theoretically, the compensation amount is the optimized amount that enables shareholders to bear the minimum residual loss, considering all agency costs (Jensen and Meckling, 1976).

Prospect theory is another theory that is related to the agency problem. Unlike contract theory, which is based on the risk-aversion assumption, prospect theory is built on the loss-aversion assumption (Kahneman and Tversky, 1979). Wiseman and Gomez-Mejia (1998) have created an agency model based on a combination of contract and prospect theory. This model argues that contract theory and prospect theory complement each other, thus helping explain executive risk-taking behaviors. Prospect theory claims that executives are willing to take risks under certain conditions, for instance, when they are afraid of losing pay or missing business targets that they believe are achievable. Executives are unwilling to take risks once the additional incentive offered if a pre-established performance target is achieved cannot offset the potential benefit loss if the performance goal is not achieved (Balsam, 2002). Prospect theory tells us that when executives make decisions, they prefer minimum losses to maximum wealth. Corporate governance mechanisms, strategic decision making, and predefined business goals influence executive risk taking and consequently affect executives' risk perception related to their wealth. Therefore, the compensation of loss-averse executives is the product of the amount of risk taken and corporate-governance arrangements (Wiseman and Gomez-Mejia, 1998).

The separation of ownership and control is common in modern companies. This separation leads to divergence between owners' and executives' interests. According to the abovementioned contract theory, the balance of power between owners (principals) and executives (agents) will influence the business goal that is the result of the contract, consequently influencing the level and structure of executive compensation.

That said, managerial power theory does not view executive compensation solely as an instrument that mitigates the agency problem. Instead, the theory argues that agents (executives) are likely to use their discretionary power to establish their own pay because of the relationship between principals and agents. From this perspective, executive compensation is no longer a solution to the agency problem; rather,

executive compensation itself is part of the agency problem (Bebchuk et al., 2002). Executives have the ability to use their power to influence a company's decision makers (Fama and Jensen, 1983). From the perspective of a perfect contract, the use of discretion is ruled out because executives will comply with their contracts' restrictions so they can obtain the incentives provided by those contracts. Under such conditions, discretion is merely a cost associated with the principal-agent problem. Unlike the complete contracting theory, the relationship between principals and agents and the use of discretion are considered as possible behaviors (Grabke-Rundell and Gomez-Mejia, 2002) by the managerial power theory, which argues that if executive compensation is the outcome of a principal-agent relationship, both sides will exercise discretion in the compensation-setting process.

Class hegemony theory extends managerial power theory, arguing that executives inside and outside of a company have the same interests, thus extending managerial views beyond the company's boundaries (Gomez-Mejia, 1994). Executives' common interests and shared objectives across companies create bonds that go beyond a single organization. These bonds create a close relationship among executives in different companies and naturally build a class across different organizations. As members of a single class, executives can protect both their own privileges and the benefits associated with their class. Gomez-Mejia (1994) notes that although most executives only fight to retain their own relatively high compensation, the behavior is a token of executives' power to protect their class's shared interests. Thus, setting executive compensation shows the power of the managerial class to protect managers' common interests and benefits against threats.

2.3.1.3 The symbolic-reflecting approach

The third approach to executive compensation includes theories that consider compensation to be a social symbol that reflects executives' expectations, status, or roles in a firm or organization. Compensation also plays a role, though it is a less

important one, in executive motivation. Arguments for this approach focus on executives' roles and the appropriate level of pay to reflect their status. Several theories will be mentioned in the paragraphs below, including tournament theory, figurehead theory, implicit contract theory, stewardship theory, and crowding-out theory.

Tournament theory treats executive compensation as a contest prize (Lazear and Rosen, 1981). The CEO, who holds the highest position in the organization, normally receives the highest pay in the tournament. The highest-paid CEO sets visible incentives to other people in lower positions and motivates them to climb up through company hierarchies; this motivation also increases the productivity of lower-ranked people (Rosen, 1986; Balsam, 2002). Balsam (2002) further argues that although CEO compensation provides the CEO himself with incentives, it plays a more important role in motivating subordinates who are lower in the company hierarchy. The top prize in the company is often set at a disproportionately high level, which lengthens the career path of high-ranking managers (O'reilly et al., 1988). Highly varying pay levels at different levels of the managerial hierarchy are required as symbols to keep the tournament operating properly. A disproportionately high pay level for the top rank should be established to attract lower-ranked managers that struggle to move to the upper levels.

According to figurehead theory, behaviors are assumed to be based on the actor's intentions and purposes, whereas in a company, a diversity of goals and interests co-exist (Ungson and Steers, 1984). Because a firm encompasses various conflicting goals and interests, actions and decisions are made in the context of bargaining and compromises. Those with the most power will receive the largest rewards based on their interactions with firm politics. Ungson and Steers (1984) argue that three perspectives can be identified from executive roles. The first role is that of a lateral communicator for shareholders, authorities, employees, and the general public. In this role, executives play the roles of symbolic or political figureheads when

communicating either within or outside the company. The second role involves maintaining a company's internal and external political alliances and acting as a strategist. In the third role, executives also act as internal politicians in the relationships among board members, especially when new directors and executives are recruited and their compensation is set. Because executive managers play multiple roles in the company, Weick (1979) argues that the appropriate role for a manager might be that of a missionary. Because of these multiple roles, executive compensation is established both to reflect executives' capability to manage this complexity of symbolic roles and to reflect their authorization in the company. Gomez-Mejia (1994) argues that executive compensation itself is an aspect of executives' status both within and outside the company, and it is a way to reinforce their figurehead images. The design of a firm's executive compensation structure depends on the complexity of symbolic roles and adapts the company's internal process to protect the company's best interests.

Stewardship theory is another well-known theory in the symbolic approach. Although stewardship does not construct a clear hypothesis on either executive compensation levels or compensation structures, people may argue that it is unsuitable for discussion on executive compensation. However, stewardship theory provides another perspective from which to study executive compensation and it does not necessarily need to measure firm financial performance (e.g., Davis, Schoorman and Donaldson, 1997). From a sociological and psychological point of view, stewardship theory—as opposed to agency theory—envision employees as supporters and collectivists. Stewardship theory argues that subordinates are collectivistic and trustworthy, whereas agency theory assumes that subordinates are opportunistic, selfish, and individualistic (Donaldson, 1995). Some scholars (e.g., Donaldson and Davis, 1991; Davis et. al., 1997) argue that employees' (stewards') motivations are in line with the interests of their principals and firms and that even when the interests of employees and principals diverge, employees still tend to cooperate. Stewardship theory assumes a strong link between the firm's success and the principal's satisfaction and denies

that companies have general motivation problems. Donaldson et al. (1991) argue that executive compensation plays a less important role in executive motivation because spiritual and non-financial rewards are more essential. According to stewardship theory, executives are intrinsically motivated by others' achievements and recognition. According to this argument, executive compensation makes only a minor contribution to executive motivation and is a less important part of the recognition that executives receive for being stewards of the firm.

Crowding-out theory extends the above discussion on intrinsic and extrinsic motivation. This theory argues that financial or monetary incentives can crowd out both intrinsic motivation and positive intentions (Frey, 1997a 1997b). Although compensation plays a role in executive motivation, intrinsic motivation is relatively more important in the pursuit of a company's organizational goals. That said, it is important to maintain a proper balance between intrinsic and extrinsic motivation. If executives receive too much compensation or extrinsic incentives, their intrinsic motivation could be extinguished, resulting in decreased effort. Frey and Osterloh (2005) argue that if executive compensation is too high, intrinsic motivation is driven out, and therefore, executives may pursue goals that do not align with the firm's best interests. Thus, executive compensation provides executives with secondary motivation; a relatively higher level of intrinsic motivation requires a lower level of extrinsic motivation, which itself requires a lower executive compensation level and fewer financial incentives.

Implicit contract or psychological contract theory (e.g., Rosen, 1985; Baker, Gibbons and Murphy, 2002) is the fifth symbolic-approach theory that this thesis discusses. Psychological contract theory argues that a contract between an individual and his or her counterpart comprises, perhaps implicitly, beliefs about a natural exchange agreement. A psychological contract is a set of individual personal expectations about his obligations and entitlements, about which the other contractor may agree (Kidder and Buchholtz, 2002). Baker et al. (2002) use the term "relational contract" to

describe the above situation and argue that a relational contract may be composed of either informal agreements or unwritten items that are recognized by one of the contractors and that influence his behaviors. The relationship contract is based on the contractors' common understandings and beliefs about fairness and justice. The nature of an executive's job and status in the company forms a relational contract, and therefore, executive compensation is seen as a symbol that reflects achievements, appreciation and esteem (Kidder and Buchholtz, 2002).

The sixth symbolic-approach theory is social comparison theory. The foundation of this theory is comparison of a firm's top-level executives with the executives of other companies. Many scholars (e.g., O'Reilly, Main and Crystal, 1998; Goodman, 1974; Festinger, 1954) argue that when executive compensation is being set, executives tend to compare their own compensation level with that of other executives. This theory arises out of the argument that people like to appraise their own capabilities against those of other people. When making such comparisons, people also tend to select as reference points individuals whose performance is similar to their own, and it is preferable to choose others who may perform slightly better or at a higher level of professionalism. When setting compensation levels, executives make judgments based on their own and other executives' experience and pay level (O'Reilly, Main and Crystal, 1988; Gomez-Mejia, 1994). Therefore, executive compensation not only plays a symbolic role but also indicates a judgment of other executives.

Taking exception to the several theories set forth above, Simon (1957) argues that compensation is defined by a company's internal salary scale. Because of the introduction of authority relations, a hierarchical structure (normally a pyramid shape), is formed in large organizations. It is common sense and a matter of wide social acceptance that executives receive higher compensation than their direct subordinates. Following this logic shows both that people who hold entry-level positions normally receive the lowest compensation in the company and that this compensation is benchmarked by compensation levels in an open labor market. The theory argues that

there is a socially enacted compensation gap between higher levels and their immediate subordinates. Therefore, executive compensation can be defined by hierarchical levels in the company and market-based pay at the lowest level.

2.3.1.4 Summary of theoretical approaches to compensation

The thesis has reviewed several major theoretical approaches to executive compensation. However, these theories are contradictory and somewhat overlapping. Each standalone theory may not explain how executive compensation is set, but in the aggregate, these theories focus on the issue of how much to pay, how to pay, and what pay should be represented. Later in this study, the thesis uses these theories to construct research hypothesis.

2.3.2 The relationship perspective

In this section, the thesis reviews major previous studies on the relationship between executive compensation and several important issues involving firm operations, including firm performance, dividend policy, and mergers and acquisitions.

2.3.2.1 Executive compensation and firm performance

The relationship between executive compensation and firm performance has been a popular topic in academic publications. Most studies on this topic compare executive compensation with various accounting indices, but relatively few studies have focused on stock price (e.g., Murphy, 1999; Bebchuk and Fried, 2004; Dever et al., 2007).

It has been argued (Dow and Raposo, 2005) that firms that implement executive compensation schemes based on firm performance typically execute more difficult strategies than do firms that do not link executive compensation to firm performance. In most cases, when firms announce an executive compensation scheme based on firm performance, their stock price will go up (Morgan and Poulsen, 2001) because the

market believes that executives attempt to improve firm performance—and thus, the firm's market value—to secure their own benefits according to their compensation scheme.

Some scholars (e.g., Deckop et al., 2006) argue that firm performance is negatively related to short-term aspects of executive compensation but positively related to long-term executive compensation. However, other authors (e.g., Sanders, 2001a) report that compared to firms that adopt only predefined long-term compensation schemes, such as stock options or restricted stock, firms that adopt year-end readjustments of executive compensation will demonstrate better firm performance. This finding indicates that executives, especially CEOs, will maintain better firm performance if they know that the firm will readjust their compensation at the end of each fiscal year based on firm performance; moreover, firm performance will be relatively poor if executive compensation is solely based only on long-term firm performance. Better performance can also be achieved if the CEO serves as the chairman of the board of directors (Baliga et al., 1996).

Firm governance and ownership structure also influence both executive compensation and firm performance. One interesting finding is that if owners either control or work as managers in the company, there is a much closer relationship between executive compensation and company performance than in any other cases (Wener et al., 2005). CEOs in firms in which a family holds block ownership, or who are family members in family-controlled firms, receive relatively less total compensation than outside CEOs. Total CEO compensation increases with the proportion of a family's total firm ownership (Gomez-Mejia et al., 2003). However, the total compensation gap between inside and outside CEOs remains even if firm performance increases (Coombs and Gilley, 2005).

Firm operational strategies are reported to influence both executive compensation and firm performance. Carpenter (2000) argues that when firm performance is low, the

relationship between firm strategy and a change in CEO compensation is positive, whereas this relationship is negative when firm performance is high. Tuschke and Sanders (2003) further argue that firms are more likely to achieve better performance when they use defensive strategies and pay their executives in cash and bonuses and when they evaluate executives' performance based on accounting items. When firms use aggressive or prospective strategies and pay their executives either in stock options or in stock—and when they evaluate executives' performance based on market valuation—they are more likely to achieve better performance. In general, firms tend to pay executives more when agency problems are more severe than when agency problems are less severe (e.g., Core et al., 1999; Adams et al., 2005). If executives' behaviors are not monitored sufficiently, they will attempt to take higher compensation from the firm—i.e., from shareholders—than when their behaviors are monitored effectively.

Some scholars argue that performance-based compensation plans are more appropriate for the highest executives, such as CEOs, than for other executives (e.g., Ang et al., 2002; Aggarwall and Samwick, 2003) because CEOs have more power and influence than lower-level executives to affect firm performance. Although the amount of compensation is important, many authors (Mehran, 1995; Kole, 1997) argue that the compensation structure—especially stock options as a percentage of total compensation—is more important. To motivate major executives (except for CEOs), it is necessary to offer significant long-term incentives such as stock options or restricted stocks. Although CEOs play a critical role in firm performance, Carpenter and Sander (2002, 2004) argue that a firm's long-term performance is related not only to the amount of total CEO compensation or the percentage of long-term incentives in total compensation but also to the amount of compensation provided to lower-level executives. This argument suggests that if the CEO receives compensation that is too much higher than that received by other executives on the top management team, those other executives may not make an active effort to increase firm performance, instead acting as “free riders” who rely on CEOs for better

performance. Henderson and Fredrickson (2001) note that the compensation gap between CEOs and other high-level executives is a type of predictor of firm performance. When there is a change in a firm's executive team, the gap between the CEO and other executives is positively related to the number of executives in the tournament, which means that having more executives on the executive team results in a larger compensation gap. That said, the amount of any change to executive pay has only a weak influence on firm performance (Conyon et al., 2001). Furthermore, although it is essential to have a considerable compensation gap between CEOs and other executives, to motivate all executives to pursue the best firm performance, that difference should not be too significant. A firm's hierarchical structure influences not only the design of its executive-compensation scheme but also (and more importantly) the interactions of the firm's executives (Boyd and Salamin, 2001). Consequently, top executives will receive more total compensation than lower-level executives, and top executives have more power to influence the firm's strategic decisions. Carpenter and Sander (2004) argue that the total compensation and long-term compensation of top executives—as opposed to CEOs only—have a positive relationship to firm performance.

An executive's status can influence his or her compensation. Milbourn (2003) reports that top executives with a strong professional background and reputation will receive higher total compensation because shareholders believe that those executives' decisions will directly increase the firm's stock price and, thus, their wealth. Top executives with a strong background will also receive higher total compensation than non-certified CEOs when firm performance is high but lower total compensation when firm performance is low (Wade et al., 2006). This is because, as Hayward et al. (2004) argue, star CEOs tend to be overconfident about both their past experience and their future ability to affect firm performance.

Stock options have become a compensation component that is accepted by many firms. Stock options allow shareholders to know that if they lose money because a

firm's stock price drops, the same thing will happen to top executives that have been granted stock options. When executives are paid exclusively in cash, they will choose to make fewer than the optimal number of investments. Conversely, when executives are paid primarily in stock options, they will ultimately make more than the optimal number of investments (Narayanan, 1996). Therefore, the ideal way to motivate executives to make appropriate long-term investments is to combine an appropriate ratio of cash and restricted stocks as components of executive compensation.

The primary purpose of granting stock options to executives is to motivate them to be concerned about the firm's stock price so that they can exercise their stock options at a higher price while securing benefits for the firm's shareholders. However, there are additional reasons that drive firms to provide executives with stock options. Core and Guay (2001) argue that if firms have financing constraints or capital shortages, they are more likely to provide stock options than cash incentives because the provision of stock options is a rational way to offer executives compensation while spending less cash. Similarly, when firms have higher expectations of future growth, they will tend to offer their executives stock options (Kato et al., 2005). The reasons for this situation are not only a possible lack of cash but also an intention to motivate executives with expectations of future growth so that both the firm and its executives can be rewarded. The above arguments are supported by the fact that most high-technology startups are willing to adopt stock options as a key compensation component.

One inevitable question about stock options is as follows: if firms grant stock options to executives but firm performance does not meet predefined expectations within a certain time frame, how should previously granted stock options be treated? To retain executives, firms whose performance is lower than expected will typically re-price previously granted stock options rather than simply recalling the options. This process is referred to as "resetting" a stock-option plan (Brenner et al., 2000; Chen, 2002). Resetting the stock options will decrease the actual exercise price of stock options to a

total value that is sufficiently attractive to executives whose future likelihood of exercising the options is both reasonable and, compared with previous conditions, higher. The purpose of stock-option resetting is to motivate executives to renew their efforts to increase the firm's stock price and, consequently, shareholders' wealth. Stock option re-pricing happens more often in companies that are startups (that is, new high-technology firms of relatively small size) and companies that have low performance levels (Brenner et al., 2000; Carter and Lynch, 2001; Chen, 2002). Chance et al. (2000) also report that firms whose boards are dominated by insiders are more likely than other firms to implement stock option re-pricing. Those authors note that some firms re-price repeatedly. In such situations, firm performance is quite poor at the time of the first re-pricing, but at the time of the second re-pricing, the option prices are generally in-the-money. If firms have to re-price more than once, the effort encouraged by the original stock options is diluted. To make it feasible to execute stock options, firms need to reset the options' price close to the stock's market price; this requirement explains why stock options are typically in-the-money within two years. Some scholars (e.g., Pollock et al., 2002) argue that the higher the percentage of a notable CEO's firm ownership, the less influence the CEO has to negotiate an exercise price of stock options that deviates from market value because the market worries that the CEO will use such a price deviation to advance his/her self-interest. According to this logic, if a CEO has a considerable ownership stake in a firm, over the years, he/she tends to keep his/her incentive plans based on fixed compensation but does not re-price based on yearly performance and market conditions (Grossman and Cannella, 2006). If the firm's stock market price is much lower than the price level at which executives can exercise their stock options, and the supposedly positive incentives of the stock options have disappeared, Chen (2002) argues that to keep their executives, firms will redo their stock option plans and adjust their exercise prices to an attractive level.

Although stock-option resetting has been widely adopted by industries for years, some scholars criticize the practice, arguing that firms are retaining unqualified executives

and that providing executives with a “second chance” forces shareholders to pay unnecessary and undeserved remuneration to executives. Garvey and Milbourn (2006) argue that executives are not always paid for firm performance; sometimes, their pay is based on the luck of the overall market situation. In a mature market situation and with an effective manager market, when a firm experiences unsatisfactory performance, shareholders typically find a way (for example, resetting stock-option plans) to retain the firm’s executives. However, in emerging markets, executives from firms with poor performance have fewer opportunities to obtain similar jobs (Gibson, 2003). Therefore, in an emerging market, an incumbent CEO’s term can be decided by firm performance, business risks, and firm ownership type, namely, whether the firm is family-owned (Gomez-Mejia et al., 2001). The debate about whether re-pricing is an effective method of motivating executives to deliver good firm performance is ongoing. Some argue that there are many outside factors that may cause bad (or worse) firm performance and that are beyond executives’ control. For this reason, Acharya et al. (2000) argue it is necessary to retain re-pricing as a component of executive compensation contracts.

One interesting study of the relationship between compensation and performance has been conducted in the context of mutual funds. Because fund managers’ compensation is partially tied to fund performance, managers tend to make speculative investments to achieve above-average fund performance and, consequently, to obtain additional compensation (Golec and Starks, 2004).

Many studies have focused on executive compensation in relation to a firm’s relative—as opposed to its absolute—performance. Unlike a firm’s relative performance, which compares its present operational situation with its previous situation, a firm’s relative performance compares its performance with the performance of similar firms in the market. In an absolute performance-based compensation plan, executives are offered additional compensation if the firm’s current performance is better than its performance in previous years, based on a group

of accounting items (Hermalin and Wallace, 2001). However, in a relative performance-based approach, firms are compared not with their own past performance but instead with the performance of their primary competitors. Relative performance compensation requires a more complex, demanding methodology than traditional compensation based on absolute firm performance. Executives can only receive additional compensation when their firms deliver better performance than other firms in the market; however, this goal can be very difficult to achieve, especially when a firm's market competitors are strong. Therefore, relatively poor performance in a market may influence executive compensation, as argued by Aggarwal and Samwick (1999). However, some authors, such as Garvey and Milbourn (2004), argue that relative performance compensation is a way to remove the influence of the overall market situation because if the market situation is much better than in the past, firms may enjoy rapid growth that is not organic but is instead caused by the market situation.

On-the-job perquisites also have an important influence on the relationship between executive compensation and a firm's relative performance. Yermack (2006) reports that on average, firms that allow their CEOs to use company airplanes for their personal travel have firm performance that is 4% lower than the market average.

Some interesting studies report that top executives that attempt to improve firm performance by reducing human resource costs receive more compensation than other executives. Brookman et al. (2007) also report that the executives of firms that announce layoff plans receive an average of approximately 20% more compensation than do the executives of firms that do not announce such plans. Brickley et al. (1999) report that an effective way to motivate CEOs to improve firm performance is to ask them to serve on the board of directors after they retire.

Innovation and R&D investment are reported as important components in determining executive compensation. Balkin et al. (2000) find that after controlling for firm size,

performance, and other factors, short-term CEO compensation is strongly related to a firm's degree of innovation, as measured by patent quantity and R&D spending; in non-high-technology companies, this relationship does not exist. Makri et al. (2006) also note that as a firm's technological intensity increases, its total CEO compensation will be more closely connected with firm spending on R&D activities and the contribution of the firm's inventions to R&D activities, whereas the CEO's bonus will be more closely connected to the firm's financial results.

Although it is widely accepted in theory, executive compensation based on firm performance remains questionable to many scholars and firms in practice. Tosi, Werner, et al. (2000) argue that firm performance is not the biggest factor in determining executive compensation. Unlike firm size, which has an influence of approximately 40% on executive compensation, firm performance variables explain only 5% of executive compensation. Some firms, as reported by Beer et al. (2004), do not adopt performance-based compensation, instead believing that the benefits from such plans are outweighed by the potential costs of administering them. Such firms introduce different methodologies, such as the balanced scorecard, management by objectives (MBO), and coaching and training, which they believe are more relevant and cost-effective.

In summary, people can argue that performance-based pay is one of the best methods to increase shareholder wealth because it mitigates agency costs (at least to some extent), in reality, such compensation arrangements do not perform as expected. For example, most of the fraudulent bankruptcy cases in the United States since the collapse of the NASDAQ have been implicitly related to executive stock options. Because a large portion of some executives' compensation is related to stock price, those executives have created fraudulent accounting records and cheated the market to increase the firm's stock price to the level at which they can exercise their stock options, reaping tremendous benefits in the process. Because of these problems, the use of stock options is declining while some other long-term compensation

arrangements have become prevalent, including restricted stock. Restricted stock is different from stock options in that it can only be sold on a long-term basis, and executives do not risk losing everything if they cannot raise the stock price higher than the exercise price level required by a stock-option arrangement.

2.3.2.2 Executive compensation and dividend policy

There is little research on the relationship between executive compensation and dividend policy. Some studies focus on the relationship among executive compensation, dividends, and firm growth. The impact of the use of stock options on dividend policies in the US and Japan is also discussed in previous studies.

Smith and Watts (1992) report a general finding that large companies normally pay their executives both higher dividends and higher compensation than smaller companies.

When a firm announces that it will pay a higher dividend than in previous years, the market normally responds positively, and the firm's stock price will increase. Lippert et al. (2000) report that in the above context, companies whose executives receive a considerable portion of their compensation from stock options will experience lower stock price increases than companies whose executives are not paid in stock options. These authors provide two possible explanations for this phenomenon. The first explanation argues that both pay-for-performance and higher dividends are effective methods of controlling executives' opportunistic behaviors, and thus, the stock market believes that higher dividends will improve firm performance. The second explanation is derived from behavior finance theory; it holds that when executives make a higher financial and psychological investment in a project, they are likely to be overly optimistic in their belief the project will be successful, and thus, they release incorrect information to the market. If the market interprets higher dividends as an incorrect message from executives, it will influence the stock price to decrease.

Kato, Lemmon, et al. (2005) examine the relationship between the use of stock options and dividend policies in the Japanese market. However, they do not find that the adoption of stock options changes firm dividend policy, as reported above by Lippert et al. (2000).

In a company in which the executives have significant ownership and there are significant agency problems, Fenn and Liang (2001) argue that executives are motivated to increase dividend payments. If executives both have significant ownership and lack monitoring from the shareholders and other external parties, they can extract more compensation from higher dividend payments. Brown et al. (2007) also report that American executives with higher levels of company ownership have been more likely to increase dividend payments since the 2003 implementation of tax cuts.

2.3.2.3 Executive compensation and mergers and acquisitions

Over the past few years, mergers and acquisitions have been increasing. The existing literature primarily addresses the use of compensation plans to defend against outside takeovers (e.g., Pagano and Volpin, 2005). Stock options can be an effective way to defend outside takeovers because if top executives have significant stock options, when they learn about a potential takeover they will defend their organizations and positions in an effort to protect their future remuneration.

Datta et al. (2001) argue that when executives receive stock options, they choose those companies that are well-run and that have a significant capacity for growth. These companies are able to guarantee an increased stock price, and executives can exercise their stock options when the price reaches a particular level. If executives choose bad companies, they cannot exercise their stock options because their stock price will not have increased to the designated level. Therefore, the best way to motivate executives and improve shareholder value is to grant stock or stock options

to both executives and directors (Deutsch et al., 2007).

What will happen when a company acquires another company? In most cases, when top executives make a successful acquisition, they will receive additional compensation in the form of cash or a bonus (Bliss and Rosen, 2001; Wright et al., 2002; Hartzell et al., 2004). The amount of such additional compensation is related to the executive's power in the company (Grinstein and Hribar, 2004). Executives with more power will receive more compensation than will executives with less power (Coombs and Skill, 2003); such premiums are negatively related to the degree of external monitoring activities (Wright et al., 2002).

When a company is acquired, if its executives chose to remain, they typically will receive increased compensation. However, most of these executives will leave during the next three years, having received a severance payment. Most executives that leave the company during acquisition retire, with only a few accepting executive positions at other companies (Hartzell et al., 2004).

The threat of external mergers and acquisitions is also regarded as a method of controlling executive compensation (Aggrawal and Knoeber, 1998). Chakraborty and Arnott (2001) argue that this threat can also drive employees to abandon productive activities in favor of defensive activities. When top executives fear that they will lose their jobs because their company is purchased, they will not attempt to increase their compensation by very much. However, as Bertrand and Mullainathan (2003) argue, mid-level managers and clerks will ask for higher compensation in such situations.

Executives' fear of a takeover can be managed by the introduction of anti-takeover mechanisms such as golden parachutes (Borokhovich et al., 1997; Field and Karpoff, 2002). Golden parachutes increase the possibility of a successful acquisition by offering top executives not only the firm's value but also a significant amount of money as compensation for agreeing to leave.

Many authors (e.g., Borokhovich et al., 1997; Field and Karpoff, 2002) argue that the use of golden parachutes is a positive development in executive compensation because executives that have golden parachutes receive more compensation than executives that do not. When a company adopts a golden parachute plan, if the compensation committee has more insiders, the market will react negatively and the stock price will decrease. Conversely, if the compensation committee has more outsiders, the market will react positively and the stock price will increase (Davison, Pilger and Szakmary, 1998). A lack of significant firm ownership among executives is negatively related to the adoption of anti-takeover mechanisms, whereas when executives do have significant firm ownership, the firm normally adopts more anti-takeover provisions to enable the executives to protect their wealth in the event of a successful acquisition (Boyle et al., 1998).

Borokhovich et al. (1997) report that the use of golden parachutes is negatively related to the firm's stock price because golden parachute adoption is interpreted by the market as a signal that the firm is acting to protect low-performance executives. Evans et al. (1997) support this argument; their study shows that on average, banks that adopt golden parachutes have lower performance compared to banks of the same size that do not adopt golden parachutes. Executives who have golden parachutes do not fear either low performance or takeover. If they have poor performance and shareholders want to terminate them, they will receive compensation because of the golden parachute plan, with the same result in the event of a takeover.

In a spin-off context that does not involve an external merger and acquisition, the act of selecting a new CEO and the design of executive compensation are not strongly related to positive reactions to a spin-off announcement (Seward and Walsh, 1996).

In management-controlled firms that lack a single block owner, the primary compensation policy is to maximize CEO pay. In contrast, in companies with a major outside owner, the primary compensation policy is to minimize CEO pay (Hambrick

and Finkelstein, 1995).

2.3.2.4 Executive compensation and firm capital structure

The literature on firms' capital structure and executive compensation concentrate on the influence of executive ownership on the firm's debt structure, the firm's capital structure, and how the market acts as a mechanism to control executives and maximize firm value.

Datta et al. (2005) report that firms whose executives have significant ownership normally choose short-term debts, whereas firms whose executives do not have significant ownership normally choose long-term debts. More specifically, if a considerable portion of executive compensation is related to future stock price, the firm's executives are more likely to choose short-term debts because they are afraid that long-term debts will negatively impact the firm's stock price in the long run, thus decreasing their personal wealth.

Kato et al. (2005) report that in Japan, firms that provide stock options to their executives generally have lower levels of debt than firms that do not provide stock options to their executives. These authors find only weak evidence that firms choose stock options to improve firm performance. Other authors (e.g., Calcagno and Renneboog, 2007) argue that when a firm has risky debts, the best way to minimize risk is to offer executives stock options based on firm performance because those executives will attempt to improve the firm's performance so they can exercise their stock options and rebalance the firm's capital structure. Cadenillas et al. (2004) discuss the function of granting stock and stock options to executives and argue that the most effective way to motivate executives to maximize firm value is to grant high-leverage stock options to good managers while granting low-leverage stock options to less-good (i.e., ordinary) managers. The authors reason that good managers have capabilities and will make efforts to increase stock price, but ordinary managers

may not have such competence, and therefore, it is better to motivate them to make their best efforts to increase stock price to a certain level so that they can exercise their stock options. Lewellen (2006) notes that firm leverage can increase stock volatility but that higher stock option ownership is more likely to increase the volatility costs of debt.

The corporate finance literature has regarded optimized capital structure as a way to maximize stock price. When a firm signals the market that it is changing its capital structure, the market generally interprets that change as a positive indicator of the firm's future performance. Firm performance is observed to decrease when the firm changes equity to debt over time (Born and McWilliams, 1997). Berger et al. (1997) report that executives that lack monitoring from external parties (e.g., the market) are less likely to choose an optimal capital structure that increases firm value. Coles et al. (2006) argue that if CEO wealth is more sensitive to stock volatility, CEOs will increase firm leverage to extract personal benefits. The likelihood that a misstated or fraudulent financial statement will be made to protect executives' wealth also increases considerably when CEOs incur new debts (Efendi et al., 2007).

Sundaram and Yermack (2007) argue that executives with high debt incentives will manage more conservatively. Cumming, Fleming, and Suchard (2005) report that in Australia, top executives are more highly remunerated than venture capitalists, which indicates that these venture capitalists extract wealth from the manner in which they invest capital in the company.

2.3.2.5 Executive compensation and risk aversion

One important topic related to executive compensation is risk aversion (e.g., Ross, 2004). The most valuable study on this topic relates executive compensation to risk that coexists with the grant of either stock options or restricted stock. The most common question about this relationship focuses on how much of a link between

compensation and stock price shareholders should grant to motivate executives to improve the firm's value and increase its stock price.

When shareholders provide executives with stock options—whether small or significant—based on the firm's stock price, it is not guaranteed that the executives will receive the compensation. Instead, the executives are compensated only when they increase the firm's value and drive the stock price to the level at which they can exercise the options, converting those (risky) options to real personal wealth.

Restricted stock is another compensation component that is related to risk. Restricted stock cannot be sold until a certain amount of time—normally between 3 to 10 years—has passed. The difference between stock options and restricted stock is that stock options require executives to increase the firm's stock price to a certain level before they can exercise their options and receive real compensation. Restricted stock requires executives to stay with the company long enough (i.e., longer than the restriction period) to sell their unlocked stock and receive compensation. The common feature of these two types of compensation is that the amount of compensation received by executives depends on the stock price when they sell either the stock or the option. Some argue that stock options are riskier than restricted stock because executives can only sell their options when the stock price has increased to a certain level; otherwise, they cannot exercise the options and they become meaningless. Conversely, executives that have received restricted stock can always get something—regardless of the stock price—merely by remaining with the company longer than the restriction period.

Some scholars (e.g., Tian, 2004) argue that stock options can motivate executives to increase the firm's stock price to a certain level to exercise their stock options; however, when that level is exceeded, the incentive effect will decrease. Garvey and Milbourn (2004) note that if executives are young or have only a small amount of stock ownership, they are normally immune to the risk to their personal compensation

that is imposed by the market through their stock options. Jin (2002) also notes that CEO incentives will decrease if risk is associated with the firm instead of the market.

The previous literature proposes several solutions to manage the relationship between granting stock options to executives and the risks that executives can assume. Brisley (2006) argues that a possible solution for balancing the risks that executives assume is to grant executives so-called “progressive performance vesting” stock options instead of traditional stock options. Progressive performance vesting stock options allow a predefined numbers of options to vest periodically in a manner that is not linked to stock price performance. This means that progressive performance vesting stock options guarantee that executives can exercise a certain number of stock options within a certain period of time, not only at the end, as required by traditional stock options. Johnson and Tian (2000) propose another solution in which a stock option pricing model is developed with a strike price that is indexed to a benchmark. These authors argue that this model has the ability to filter out common risks that are beyond executives’ control, and thus, it can increase the efficiency of the incentive function of stock option plans. Calvet and Rahman (2006) argue that the best way to manage risk is to grant executives stock options that are indexed to the Capital Asset Price Model, thus preventing executives from engaging the firm in high-risk investment projects.

The empirical studies analyzing the relationship between risk and incentive have not succeeded (Prendergast, 2002) because their results are not consistent: some of their tests are positive and others are negative. Prendergast argues that the reason the previous literature on this relationship fails is because these studies have ignored employee responsibility when considering the uncertainty of incentives. When companies operate in a context of certainty, they will give workers clear requirements about what to do and they monitor those workers’ actions. Conversely, when companies operate in a context of uncertainty, their responsibility is to reduce opportunistic actions taken by employees to index their compensation to firm performance.

Some scholars (Miller, Wiseman and Gomez-Meija, 2002) study unsystematic and systematic firm risks, reporting that pay based on performance and potential earnings is highest when executives can control firm performance. Larraza-Kintana et al. (2007) document that employment risk and variability in compensation correspond to higher risk taking, whereas the intrinsic value of stock options and downside risks correspond to lower risk taking.

Tufano (1996) studies compensation and risk in the gold mining industry. This author reports that if executives hold a significant number of stock options, they will not manage gold price risk well; however, if they hold a significant amount of firm stock, they will manage gold price risk much better. This finding suggests that compensation structure influences executives' risk aversion and that executives' risk aversion affects the policies that executives will adopt to manage company risk.

2.3.3 The determinants of executive compensation

How to identify the determinants of executive compensation is always a hot topic among both academics and practitioners. Human resources practitioners are eager to understand key determinants of executive compensation so that they can design a better compensation scheme, whereas academics attempt to glean insight into the determinants of executive compensation because this knowledge will help them construct a better research model for describing executive compensation.

Company size has long been considered an important determinant of executive compensation. Robert (1956) studied more than 1,400 firms and reported that executive compensation is more closely related to firm size than to firm performance. Based on Robert's study, Simon (1957) argues that executive rewards are related to organizational size and the executive's position in the organization. Many scholars have conducted similar studies that follow Robert and Simon; these studies find that executive compensation is more closely related to sales revenue than to profitability,

thus supporting Robert and Simon's findings (McGuire et al., 1962; Baumol, 1967; Williamson, 1963; Galbraith, 1973). Baumol (1967) also argues that the reason that sales revenue is more closely related to executive compensation than operating profit is that the directors fail to monitor firm performance effectively. The above findings can be understood to mean that managers in a larger company will assume more responsibilities so that they deserve better compensation. This logic can lead to a situation in which managers chase better compensation by growing company size, while potentially damaging shareholders' interests when such growth is not beneficial and causing the firm's stock price to drop (Hayes and Abernathy, 1980). Ciscel and Carroll (1980) also examine the relationship among compensation, sales revenue, and profitability. Using a residual-profit approach, those authors argue that either firm size or sales revenue is the primary determinant of CEO compensation.

Some recent studies also have similar findings. Agrawal and Walking (1994) create a model to define executive compensation that includes firm size, growth capability, and firm performance. Based on an analysis of 2,009 listed companies in the US, Baber et al. (1998) report a strong positive relation between persistent firm earnings and executive compensation. Jones and Kato (1996) study panel data from Bulgaria, a transitional economy, and find that CEO pay is positively related to size and productivity but not to profitability. Based on data from 549 Chinese listed companies between 1998 and 2000, Firth et al. (2006) report a positive relation between CEO pay and the log of the book value of the firm's assets. This finding is consistent with research from other countries indicating that firm size is a key factor in defining CEO compensation. Wan et al. (2008) compare executive compensation of publicly listed companies on the Chinese and American stock exchanges and find that in both countries, market company size (defined as sales revenue and total assets) is strongly related to executive compensation; moreover, firm size's explanatory ability with respect to executive compensation is 5 times higher in the US than in China. Gabaix and Landier (2008) construct a model that can be calibrated to analyze CEO compensation, finding that a CEO's compensation increased both with the size of the

CEO's firm and the size of the average firm in the economy. Focusing on high-technology companies in the S&P 1500, Faria et al. (2014) find that firm size (measured by the natural log of asset or sales) is strongly and positively related to CEO compensation. These authors also report that asset growth has a positive influence on CEO pay but that earnings per share has a strongly negative influence on long-term CEO pay.

Many other studies report that profitability has a dominant, positive influence on executive compensation. Lewellen and Huntsman (1970) argue that profitability is more closely related to CEO pay than sales. Smyth et al. (1975) report that sales efficiency—namely, sales per dollar of assets—and profitability are significantly related to CEO compensation. However, Deckop and Mahoney (1982) argue that the authors' methodology is problematic and that their argument is flawed. Kato and Kubo (2006) study the relation between accounting measures and CEO pay in 51 Japanese companies and report that the most robust relationship link for Japanese CEO compensation is the positive relationship between ROA (return on assets, a common measure of firm profitability) and CEO pay. However, many studies reveal that a firm's performance ratio measured by ROA has a negative influence on CEO compensation (e.g., Core, Guay, and Verrecchia, 2003a; Young and Jing, 2011). These contradictory findings show that there is no common, acceptable conclusion on how to measure firm performance and executive compensation. The variety of economic systems, human resources practices, corporate governance models, and cultures among various countries may explain this situation.

Ownership structure is another key factor that influences executive compensation. Some people argue that because boards of directors are more likely to evaluate firm performance based on changes in stock price, it is understandable that there is no significant relation between accounting-based firm performance and executive compensation (e.g., Bentson, 1985; Coughalan and Schmidt, 1985). Furthermore,

salary and bonus awards will compensate executives' human capital and are not directly linked to firm performance.

One reason that might explain the above finding is that most executives do not hold a significant portion of ownership in their firms. McComas (1986) reports that in "Fortune 1000" firms, 9% of CEOs do not own stock in their firms and 61% of managers hold stock valued at less than one year's compensation. Morck et al. (1988) notes that in 371 large firms disclosed in *Fortune*, the board members' average ownership ratio is 10.6%. Han (2014) investigates 298 Chinese listed companies from 2012, finding that the average management ownership ratio is only 8.3241%, far below that reported by Morck approximately 25 years ago, thus indicating that management's share of ownership in Chinese companies is very small.

Previous studies have shown that management ownership does not have a clear relationship to firm performance either in China or in other countries (see, e.g., Fama and Jensen, 1983; Himmelberg Hubbard and Palia, 1999; Bentson, 1985; Smith and Watts, 1992; Liu and Tan, 2005; Wei, 2000; Sun and Zhang, 2006; Xu et. al, 2005). There are two major theories of management ownership and executive compensation. The first theory argues that management ownership has a substitutive effect on compensation. When managers hold significant ownership, they will have decreased sensitivity to their compensation, and therefore, in that context, there is a negative relationship between management ownership and executive compensation. The second theory argues that management ownership helps managers influence compensation decisions more easily and that managers with higher ownership will thus be offered higher compensation. However, the previous literature has shown that management ownership does not have a consistent relationship with executive compensation. Sanders (2001a, 2001b) reports a positive relationship between management ownership and executive compensation, whereas Cordeiro and Veliyath (2003) report a negative relationship.

Similar to management ownership, concentrated ownership attracts a great deal of attention (e.g., La Porta et al., 1999), especially in Asia (Claessens et al., 2000). However, few studies have focused on the relationship between concentrated ownership and executive compensation, and those that do have such a focus report different findings. Several studies report that top executives who are blockholders generally receive higher compensation (Holderness and Sheehan, 1988; Cheung et al., 2005) because executives with significant ownership will have a greater ability to influence their own compensation. Other studies indicate that a higher concentration of ownership will lead to lower compensation (e.g., Dyl, 1988; Goldberg and Idson, 1995; Hartzell and Starks, 2003; Haid and Yurtoglu, 2006; Ozkan, 2007). The argument is that concentrated ownership will increase blockholders' activism and manifest agency costs, whereas high executive compensation can be regarded as one type of agency cost. The possible explanation to interpret this conflicting evidence is that the research does not distinguish among blockholders with voting ownership and those with equity ownership (Amoako-Adu et al., 2011). Further, these studies may incorrectly conflate management ownership with investor blockholders.

Board structure is often discussed in the literature of corporate governance. Directors are believed to be a very important factor in monitoring management behaviors to mitigate agency costs. Outside directors who are not full-time company employees typically play a more important role in monitoring company management (Fama and Jensen, 1983). The literature on the relationship between independent directors and executive compensation is mixed. Ghosh and Sirmans (2005) argue that if the process of electing directors is influenced by the CEO, the board's independence will be destroyed and CEOs will give themselves above-market compensation. Aguilera and Cuervo-Cazurra (2009) summarize corporate governance codes from 46 countries and find that the majority of codes recommend a balance between executive and independent, non-executive directors. Some scholars (e.g.: Finkelstein and Hambrick, 1989; Conyon and Peck, 1998) note that compensation does not have a significant relation with the proportion of outside directors. However, some studies make the

opposite argument. Mehran (1995) empirically shows that as the proportion of independent directors decreases, CEO compensation decreases. Franks et al. (2001) argue that independent directors consider their role to be advisory, not disciplinary. Ozkan (2007) studies 414 UK companies and reports that a higher proportion of independent directors results in higher CEO compensation, thus indicating that independent directors are less effective than executive directors at monitoring management. Ozdemir and Upneja (2012) study the American lodging industry and report a strong and positive relation between outside directors and CEO (cash and total) compensation. Du and Zhai (2005) report a weak positive relation between the proportion of outside directors and CEO cash compensation in Chinese listed companies.

It is generally considered that if the CEO also serves as the chairman of the board (namely, if CEO duality exists), that CEO is more likely not only to intervene in the employment of directors but also to influence board decisions (Crystal, 1991). Boyd (1994) studies the correlation between board control and CEO compensation based on data from 193 firms in 12 industry groups, reporting a negative relation between CEO duality and board control and finding that board control is negatively related to CEO compensation. Boyd's research reveals a positive relationship between CEO duality and CEO compensation. Du and Zhai (2005) check Chinese listed companies and report an insignificant relation between CEO duality and CEO compensation based on panel data from 2002. Wang and Hu's (2011) research focuses on the abnormally high compensation of the top 3 executives at Chinese listed companies; they report that CEO duality is significantly and positively related to executive compensation. Based on data from Chinese listed public companies, many studies report similar findings (e.g., Wei and Sun, 2010; Xu and Li, 2011).

Many authors continue to devote attention to the relationship between executive compensation and various other factors. Liu and Mauer (2011) note that CEO risk-taking compensation is positively related to cash holdings but is negatively

related to the value of cash to shareholders. A few authors, including Lam et al. (2013) and Elkinawy and Stater (2011), report that female CEOs in both China and the United States generally receive less compensation than male CEOs. Ortiz-Molina (2007) highlights CEO pay and capital structure by arguing that financial leverage decreases CEO pay-performance sensitivity. Grabke-Rundell and Gomez-Mejia (2002) propose that executives' structural power, ownership power, expert power, and prestige power should have a positive relationship with their overall compensation. Based on their empirical study, Chen et al. (2011) argue that in China, an executive's educational background, political status (Executive/Party Secretary duality), and ownership are positively related to executive compensation. Some authors also argue that CEO tenure is positively related to CEO compensation (e.g.: Platt and McCarthy, 1985; Attaway, 2000).

2.3.4 A brief review of executive compensation in China

The study of executive compensation in China began this past decade and remains in an early stage. Most of the Chinese executive compensation literature can be categorized according to three aspects: (1) discussion of the factors that influence executive compensation; (2) empirical studies to test all types of relationships between executive compensation and firms' accounting items; and (3) general advice or suggestions related to executive compensation reform in SOEs.

Cao and Zhan (2003) discuss incentive theory and note that incentives can be introduced to motivate employees' proactivity and enthusiasm by considering people's needs, purposes, and motivation.

Some Chinese scholars attempt to determine which factors can affect executive compensation in the context of the Chinese market. Based on empirical studies, Yang (2004) and Luo (2009) report a positive relationship between executive compensation and company size. Corporate governance is also a very important factor that

influences executive compensation. Although they come to slightly different conclusions, many authors have noted that the largest shareholder's ownership ratio is negatively related to executive compensation (e.g., Fan, 2006; Luo, 2009), thus indicating that block shareholders can effectively monitor executives' behavior. Personal competence is also reported as a key factor that influences executive compensation. Luo (2009) finds a positive relationship between an executive's age and his or her compensation.

Factors outside the company may also influence executive compensation. Zhang (2007) and Luo (2009) study data from the transportation and information technology industries, respectively, and find that differences in area and industry are major factors that can influence executive compensation.

There are a relatively large number of studies on the relationship between executive compensation and firm performance. For example, Fang and Pan (2008) study data from 2006 on A-share companies listed on the Shanghai exchanges and report that compensation is positively related to firm performance, which supports Murphy's (1985) argument. However, some other authors (e.g.: Li, 2000; Chen and Liu, 2003, Yang, 2004) document a negative or a very weak relationship between executive compensation and firm performance. Du and Wang (2007) argue that the compensation of top executives is positively related to changes in firm and shareholder wealth between this period and the previous period; however, it is negatively related to the change in Tobin's Q during this period and positively related to the change in Tobin's Q during the previous period. This finding supports the proposition that executive compensation has the ability to motivate executives to improve firm performance. Gu and Zhou (2007) study the effect of stock options on publicly listed companies and find that when such companies control their industry, stock options do not generally provide an effective incentive function in the long term. However, because this study only contains 56 samples, its conclusion has weak explanatory value. Zhou and Wang (2007) also report that there is no relation between

executive compensation and firm performance, and they argue that executive compensation is defined by company size instead of firm performance.

Several authors have studied the asymmetry of executive compensation. Liu et al. (2003) argues that to some extent, increasing executive compensation can improve firm performance and increase shareholder wealth, but decreasing executive compensation does not have same effect and will instead have a negative influence on firm performance. Fang (2009) reports a viscosity effect of executive compensation, namely, that the scale of increase is larger when a firm's performance is improving than the scale of decrease when a firm's performance is declining.

Lin (2003) investigates the relation between a firm's future performance and compensation variations among executives. This study reports that companies with a bigger compensation gap among executives are more likely to achieve better firm performance in the future; it also reports that the compensation gap is small in SOEs.

Some Chinese scholars study executive compensation from the perspective of control power. Zhang and Guo (2007) study publicly listed companies that experienced mergers and acquisitions between 2002 and 2004, finding that executives will increase their compensation through mergers and acquisitions, which result in a larger company size and an increased number of employees. Wang and Wang (2007) argue that there is a positive relation between executive compensation and surplus management; however, when either the general manager is an inside controlling shareholder or the general manager and the chairman of the board is the same person, executive compensation will increase and surplus management will be weakened. This finding indicates the existence of management infringement in China.

A few authors have conducted studies that consider China's unique market and systemic context. Based on an empirical study of listed SOEs on the Shanghai Stock Exchange, Liu et al. (2009) argue that compensation regulation of executives in SOEs

is effective, and such regulation leads to on-the-job perks and corruption, which increase agency costs and damage firm performance. Liu et al. (2007) studies data from listed companies and argues that the lower the degree of local government intervention is or the more competitive the company's market is, the stronger the relation between executive compensation and firm performance is. This finding suggests that political influence needs to be considered when studying executive compensation in the context of the Chinese market.

Finally, numerous authors (e.g., Wang, 2010; Yang and Yang, 2010; Guo, 2010) offer recommendations to optimize executive compensation from both inside and outside the company, and in general, most suggest reinforcing the relation between executive compensation and firm performance.

2.4 Research Context and Institutional Background

One popular research field in corporate governance involves how to address agency issues in management, especially when those issues are related to the executive team. Based on previous academic studies, an increasing number of firms have opted to encourage top managers by adopting incentive schemes for their management teams, including higher salaries, performance bonuses, or stock options. To some extent, all of these practices alleviate agency issues between shareholders and the management team.

Although incentive schemes have proven to be a realistic method to solve agency issue worldwide, such schemes are restricted in China when deployed in state-owned enterprises (SOEs). Before the 1978 reform of the Chinese economy, all of China's companies were fully owned and operated by the government. At that time, top managers of SOEs were directly designated by the government, not recruited by the board of directors. Indeed, before the 1990s, SOEs did not have directors because they were solely owned by the government, which for ideological reasons refused to introduce modern corporate governance structures.

In the early 1990s, China built stock exchanges in Shanghai and Shenzhen, indicating that China was beginning to introduce a modern corporate system. Since then, an increasing number of companies have been listed on these exchanges, including many SOEs. To list SOEs on the stock exchange, the Chinese government made reforms by selling a portion of those SOEs to individual investors, private firms, mutual funds, or other institutional investors. However, this reform is not complete because these companies only have a small portion of privatized ownership; the government's ownership continues to dominate.

The abovementioned reform brought an interesting corporate-governance practice to Chinese listed SOEs. On the one hand, these listed SOEs have built corporate governance structures such as boards of directors and independent directors, and they have the ability to recruit most of their employees as needed. On the other hand, the Chinese central government and local authorities typically nominate and designate SOEs' top executives, including the chairman and general manager, which shows that various levels of the Chinese government maintain strong, controlling power over SOEs (Liu, 2001).

Because the government designates SOEs' top executives, senior managers normally enjoy (either implicitly or explicitly) certain administrative ranks according to each SOE's reporting hierarchy (Huang et. al, 2011). However, as a system, the administrative ranking of executives was abandoned in 2000. This arrangement distorts the mechanism of executive compensation in listed SOEs, which should be defined by executives' performance and contribution and not their administrative rank.

To address issues related to corruption and political reputation, many authorities including the Central Committee of the Chinese Communist Party (CCCCP) and the State-owned Assets Supervision and Administration Commission of the State Council officially released papers to regulate SOE executive compensation. Some local

governments, such as that of Chongqing municipality, even required that SOE executive annual income cannot exceed 10 times the average annual income of the SOE's other employees.

2.5 Hypothesis Development

A few scholars have investigated executive compensation regulation in Chinese SOEs. Chen et al. (2005) argue that because the government does not have sufficient information to monitor every SOE and the number of SOEs in China is tremendous, the simple way to decrease administrative costs is to define a unified compensation contract. Huang and Cao (2008) note that SOE executive compensation regulation is caused by the ambiguous status of executives. Indeed, SOE top executives are not only managers but also (and perhaps more importantly) governors with administrative ranks that represent the government's jurisdiction over SOEs.

Although the above research reveals some reasons for the regulation of SOE compensation, I believe that the government must consider the influence of public opinion. SOEs have existed in China since the 1950s. In the past, there was no criticism of their executives' high compensation because the difference between the pay given to a factory director and a front-line worker was not large. However, in the past decade, this gap has become tremendous, causing widespread objection from the public. Some authors (e.g., Shleifer and Vishny, 1994) argue that the government has the power to intervene in company operations to realize its political or social goals. The Chinese government attempts to both regulate SOE executive compensation and to harmonize society in a manner that promotes deeper economic and political reform.

Accordingly, this thesis formulates the following hypothesis:

Hypothesis 1: The SOE attribute of a firm is positively related to the compensation gap between the market-determined executive compensation level and actual executive compensation.

2.6 Research Methodology

2.6.1 Samples

The samples include non-financial companies listed on both the Shanghai Stock Exchange and the Shenzhen Stock Exchange. Financial companies are excluded from the sample because the executive compensation characteristics of financial organizations are very different from those of non-financial companies given the stricter compensation regulations that apply to financial organizations (Firth et al., 2007). The thesis chooses A-share data only because B-share stocks are traded in USD by qualified foreign investors and their total market value is small. The data of this thesis are from 2005 to 2012. The starting year is the year of China's official launch of split-share reform (Zheng et al., 2007). The "Split Share Structure Reform" in China enables state shareholders of listed companies to trade their restricted shares. This renders the wealth of state shareholders more related to share price movements and this reform will create remuneration arrangements that increase the relationship between Chinese firms' executive pay and stock market performance (Hou et al., 2013). Furthermore split share reform motivates state-controlled firms and especially those where dominant shareholders to have greater incentives to improve share return performance and corporate governance (Liao et al., 2008). That said split share reform significantly influences corporate governance (Wang et al., 2010) and agency problems (Tseng, 2012) which also largely influences firms' investment behaviors (e.g.: Li, 2008; Huang et al., 2011; Qiang, 2012). To eliminate split ownership impact to executive compensation and firm investment behaviors, this thesis chooses data after 2005 when split share reform was implemented.

Executive compensation information can be obtained from listed companies' annual reports, as the Chinese CSRC has required all listed companies to disclose information about top management's compensation since 1998.

In this research, the dependent variable is total cash compensation of all of the

executives disclosed in each firm's annual reports. Lagged values of executive compensation from year $t-1$ are used in the regression. The independent variables are accounting items, corporate governance-related data, and basic company information such as number of employees, industry attributes, etc. All of these data can be obtained from CSMAR data. Because some items are missing from the CSMAR data, the size of the total samples is somewhat reduced. Following a necessary data trim, the samples for the executive compensation regulation study contain data from 1,481 companies and include 12,260 firm-year observations.

2.6.2 Research methods

The hypothesis of this study is that the SOE attribute has a positive relation to the gap between market-determined executive compensation and actual executive compensation. The study is divided into four steps. The first step is to construct a market-determined executive compensation model based on all Chinese listed companies. The second step is to predict expected executive compensation for each firm based on the model constructed in the first step. The third step is to calculate the gap between expected executive compensation and actual executive compensation for each firm. The fourth step involves checking the correction between each firm's SOE status and the executive compensation gap based on a regression. A detailed description of my method is provided below.

The first step is to define the market-determined executive compensation level. This research intends to prove that SOE executive compensation is regulated, resulting in the actual compensation granted to SOE executives falling below a benchmark. According to the basic manager-market theory (e.g.: Robert, 1956; Gomez-Mejia, 1994) and human capital theory (e.g.: Agarwal, 1981; Harris and Helfat, 1997; Combs and Skill, 2003), executive compensation is determined by the market, this thesis uses the market level as the benchmark. The ideal market level should be defined by all of

the companies in the market. However, because the compensation data for private companies are normally unobtainable and because executive compensation in publicly listed companies and in private companies may be slightly different, this research selects all non-financial listed companies as a substitute for the market as a proxy to study executive compensation of publicly listed companies. This study also uses all non-state listed companies as the proxy for the market level in its comparison. In step one, the thesis constructs a model using a regression equation to describe executive compensation by considering variables related to various aspects, including company size, accounting performance, corporate governance, and industry attributes. A detailed variable description is given in section 2.6.3.

In the first step, a market-determined executive compensation model based on all listed companies is built. In the second step, this thesis predicts each firm's executive compensation from the model obtained in the first step. The output of the second step is the prediction of each firm's executive compensation, which is marked as $COMPEN_{\text{market}}$. The thesis marks the actual executive compensation extracted from the CSMAR database as $COMPEN_{\text{actual}}$.

The predicted compensation level based on the market-determined compensation model is obtained in the second step. To determine whether executives are underpaid or overpaid, the thesis calculates the difference between market-determined compensation, namely, $COMPEN_{\text{market}}$, and actual compensation, $COMPEN_{\text{actual}}$. This thesis denotes the difference between the two as $COMPEN_{\text{gap}}$:

$$COMPEN_{\text{GAP}} = COMPEN_{\text{MARKET}} - COMPEN_{\text{ACTUAL}}$$

Because executives may be either underpaid or overpaid, $COMPEN_{\text{gap}}$ can be either positive or negative. If a firm's $COMPEN_{\text{gap}}$ is positive, then its executive compensation is below market level, whereas if a firm's $COMPEN_{\text{gap}}$ is below zero,

then its executive compensation is above market level, that is, its executives are overpaid.

COMPEN_{gap} has the ability not only to indicate whether executive compensation is above or below the market level but also to reveal, through its absolute value, the degree of underpayment or overpayment. When I investigate the relation between compensation regulation and a firm's overinvestment, the value of COMPEN_{gap} is a key measurement in the regression.

To prove the hypothesis formulated in section 2.5, this thesis checks the correlation between the SOE attribute and the executive compensation gap between the market-determined level and the actual level, namely, COMPEN_{gap}; a positive and significant correlation between the two is expected.

From the CSMAR database, a company-attribute code can be obtained, which indicates the ownership attribute. By relying on this code, the thesis then creates a dummy variable, SOETAG. If the firm belongs to central government, local government, another SOE, or a state controlled organization, SOETAG is 1; otherwise, SOETAG is 0.

As mentioned above, COMPEN_{gap} can be either positive or negative. To verify the hypothesis, this thesis makes two regressions for all values of COMPEN_{gap}, including both positive and negative values and the values when COMPEN_{gap} is positive only. The rationale for such tests is that the set of full values of COMPEN_{gap} represents all sample companies, regardless of whether their executives are underpaid or overpaid, whereas the set of positive values of COMPEN_{gap} only contains companies whose executives are actually underpaid.

2.6.3 Variables

The dependent variable of this study is total cash compensation of executives in A-share listed firms. Cash compensation includes base salary, bonus, commissions, and allowances. However, because the CSMAR data do not show this breakdown, the thesis only uses cash compensation in the regression. To eliminate dimensions of both the dependent variable and the independent variables, this thesis uses the natural log of executive compensation and marks it as LNEXECOM.

To depict the characteristics of all listed companies' executive compensation based on previous studies (e.g.: Ciscel and Carroll, 1980; Agrawal and Walking, 1994; Bentson, 1985; Yang, 2004; Fan, 2006; Luo, 2009; Zhang, 2007; Firth et al., 2006; Wan et al., 2008; Young & Jing, 2011; Haid and Yurtoglu, 2006; Ozkan, 2007; Ozdemir and Upneja, 2012; Xu and Li, 2011), the thesis includes in the regression equation variables that reflect firm operating characteristics, firm performance, corporate governance characteristics, and industry attributes. Because this thesis uses a natural log of executive compensation as dependent variable, the thesis also uses a natural log for independent variables that have units; accordingly, the left and right sides of the regression equation lack dimensions.

The thesis uses a natural log of total assets as measure of company size (Firth et al., 2006; Brookman and Thistle, 2013), which is marked as LNSIZE. Many previous literatures report a significant and positive relation between company size and executive compensation (e.g., Jones and Kato, 1996; Firth et al., 2006; Yang, 2004; Wan at al., 2008; Luo, 2009). The results of standard agency models suggest that the level of pay is an increasing function of firm performance (Core et al., 1999). Some scholars argue that the firms with higher operational margin or higher return on assets will grant their executives higher compensation (He et al., 2013; Luo and Pang, 2014). To consider the relation between executive compensation and firm's operational performance, the thesis tries two variables to measure firm performance: (1)

operational gross margin, written as GROSSM; and (2) return on total assets (ROA) (Conyon and He, 2011; Du and Wang, 2009). Chen et al. (2007) argue that because of asymmetric information, to avoid moral hazard the shareholders keen to sign a compensation growth opportunity contract with firm's executives, under such contracts, executives will obtain higher compensation if higher growth opportunity occurs in a firm. Thus it is reported that firm's growth opportunity is positively relative to executive compensation (Ma and Duan, 2010). In the regression, the thesis uses the P/E ratio and market-to-book ratio (Core et al., 1999) as measurements of firm growth opportunities. Those two variables are called PERATIO and MBRATIO, respectively. However, since in China stock market, smaller companies normally have higher P/E ratio, so this thesis predicates that there is a negative relation between P/E ratio and executive compensation. Capital structure is reported as an important factor in the determination of executive compensation. Chemmanur et al. (2013) argue that in the optimal labor contract between firms and employee, a firm with higher leverage pays a higher wage to its employee to compensate him or her for the expected bankruptcy costs that will be borne by the employee, because the employee is unable to fully insure his or her human capital risk. In this study, the thesis uses the debt-asset ratio as the measure and names this variable LEVER.

In this study, management ownership, block holders, board structure, and CEO duality are considered as reflections of corporate-governance characteristics. Ownership structure is reported an important factor in determining executive compensation in previous literatures (e.g.: Holderness and Sheehan, 1988; Lambert et al., 1993; Core, 2000; Zhang, 2010). The management ownership ratio equals executive ownership divided by total ownership, and the variable is named EXESHARE which is expected positive to executive compensation. To measure block holder ownership, this thesis uses the biggest shareholder ownership ratio as a proxy to measure the ownership concentration and marks the variable SHARECON. Because block holders have higher motivation to monitor executive compensation, this thesis predicts a negative relation between executive compensation and block

holder ownership. Boards of directors are ineffective in setting appropriate levels of compensation because directors are essentially hired by the CEO and can be removed by the CEO (Crystal 1991). As such, board members may be unwilling to take positions adversarial to the CEO, especially concerning the CEO's compensation. Moreover, boards usually rely on the compensation consultants hired by the CEO, and this may lead to compensation contracts that have been optimized not for the firm, but for the CEO (Core et al., 1999). Thus the independent-director ratio, a key factor of board structure, is used to represent board structure and the variable is called IDRATIO in this thesis and is expected a positive relation to executive compensation. CEO duality is also considered in the research because CEO duality is prevalent in Chinese listed firms and impacts corporate governance (Wei and Sun, 2010; Hu et al. 2012) thus increase executive compensation level, accordingly, the thesis introduced the dummy variable CEODUALITY into the regression.

Some studies argue that CEO tenure is positively related to compensation level (e.g., Platt and McCarthy, 1985; Attaway, 2000); however, it is quite difficult to extract tenure data because the thesis is using the compensation for all executives, not individual executives, as the independent variable. Therefore, to proxy the tenure characteristic, the thesis uses the firm's duration as a publicly listed company as the substitute and call the variable COMPANYAGE.

Finally, the thesis also introduces industry dummy variables to check whether the type of industry influences executive compensation when other conditions are controlled.

Same as many previous literatures (e.g.: Du and Zhai, 2005; Wan et al. 2008), this thesis does not include provincial dummy in determining executive compensation. The first reason why provincial dummies are excluded is that SOEs are now managed by SASAC directly; the executive compensations in SOEs are more related to firm

size, industry and SOEs' administrative ranking³. Another reason is that in this research, the thesis studies compensation of all executives in the firm, normally Chinese listed firms have many branches and subsidiaries across the China or even outside of China. Executives of the firm may not locate in the same city or province. Thus it is not reasonable to determine executive compensation based on firms' registered province.

The table 2.1 below summarizes the variables to be used in the regression.

[Table 2.1]

Because this thesis checks the relationship between the executive compensation gap and SOE attribute in the fourth step of this study, Boolean variables are needed to formulate to describe the state-owned attribute of each firm based on each firm's actual controller information. The thesis finds each firm's actual controller information in segment "S0702b" of the CSMAR database. A detailed description can be obtained from the "User's manual of the Shareholder Research Database of Chinese Listed Companies—2013 Edition" (GTA, 2013). The thesis creates three variables, as set forth below in Table 2.2

[Table 2.2]

2.6.4 Models and Methodology

The model used in step 1 relies on the regression to generate the market-determined executive compensation. The initial and general model is as follows:

³ Detailed information about SOEs' administration ranking can be found from <http://finance.ifeng.com/news/special/gqybs/>

$$\begin{aligned}
LNEXECOM_{i,t} &= \alpha + \beta_1 LNSIZE_{i,t} + \beta_2 GROSSM_{i,t} + \beta_3 ROA_{i,t} + \beta_4 PERATIO_{i,t} \\
&+ \beta_5 MBRATIO_{i,t} + \beta_6 LEVER_{i,t} + \beta_7 EXESHARE_{i,t} \\
&+ \beta_8 SHARECON_{i,t} + \beta_9 IDRATIO_{i,t} + \beta_{10} CEODUAL_{i,t} \\
&+ \beta_{11} COMPANYAGE_{i,t} + \beta_{12} INDUSTRY_i + \mu_i + \varepsilon_{i,t}
\end{aligned} \tag{2-1}$$

This thesis initially estimates a fixed-effects panel data model for 2-1 equation. Where i indexes firms, t indexes years. Industry-specific effect is accounted for by including industry (INDUSTRY) in all specification. μ_i is a firm-specific time-invariant effect, and $\varepsilon_{i,t}$ is an idiosyncratic error term.

In step 2, the thesis uses equation 2-1 to predict the market-determined executive compensation level for each company as follows:

$$COMPEN_{MARKET} = Prediction\{LNEXECOM\} \tag{2-2}$$

In step 3, the thesis calculates the difference between the market-determined compensation level and each firm's actual compensation level:

$$COMPEN_{GAP} = COMPEN_{MARKET} - COMPEN_{ACTUAL} \tag{2-3}$$

The study checks the relation between $COMPEN_{gap}$ and SOE attribute in step 4 using three regressions. First, the thesis conducts a regression between $COMPEN_{gap}$ and SOETAG to investigate whether SOE attribute causes compensation regulation in all samples that have an increased $COMPEN_{gap}$. In the regressions, the study also adds COMPANYAGE, SHARECON, IDRATIO and CEODUAL as control variables to the models reflecting firm's attributes of corporate governance.

$$COMPEN_{GAP} = \alpha + \beta_1 SOETAG + Firm\ Attributes + \varepsilon \tag{2-4}$$

Next, this thesis redoes the above regression for the observations when $COMPEN_{gap}$ is NOT negative to check whether SOE attribute continues to have a positive relation with the compensation gap.

$$COMPEN_{GAP} = \alpha + \beta_1 SOETAG + Firm\ Attributes + \varepsilon$$

where $COMPEN_{GAP} \geq 0$ and $COMPEN_{GAP} < 0$ respectively

(2-5)

To further investigate the relation between various types of SOE and executive compensation, the thesis uses CENTRALSOE and LOCALTAG as independent variables in the regression, the coefficient of CENTRALSOE (that is β_1), and the coefficient of LOCALTAG (namely β_2), which tells us what type of SOE may cause severe compensation regulation.

$$\begin{aligned} COMPEN_{GAP} \\ = \alpha + \beta_1 CENTRALSOE + \beta_2 LOCALTAG \\ + Firm\ Attributes + \varepsilon \end{aligned}$$

where $COMPEN_{GAP} \geq 0$ and $COMPEN_{GAP} < 0$ respectively

(2-6)

Again, in equation 2-5 and 2-6, COMPANYAGE, SHARECON, IDRATIO and CEODUAL are added to the models as control variables reflecting firm's corporate governance attributes.

2.6.5 Statistical methods

This thesis uses **STATA 12.1** Special Edition to perform all of the statistical analyses. Major data processes and regression are programmed in STATA's script language. The STATA program and this thesis's raw data are available for checking.

2.7 Empirical results

2.7.1 Variable descriptive statistics

Table 2.3 presents descriptive statistics of the variables in the regression. To promote better understanding, the thesis presents the original data for executive compensation, company size (value of total assets), and revenue per share instead of their natural logarithm types.

[Table 2.3]

The mean executive compensation grew consistently and roughly tripled from 2005 to 2012. However, executive compensation in Chinese listed companies is far below that of companies listed in other countries, such as the US and Japan (Su, 2013). Gross margin started to grow since 2008 till 2012 with a peak in 2012 at 0.267, which might be caused by China's 4 trillion RMB stimulus plan that began at the end of 2008 and has continued throughout the global economic recession since the period.

The accounting performance measures (e.g., ROA) are very poor compared with American listed companies (Hu and Huang, 2012) and do not show a growth trend. This indicates that overall, the performance of Chinese listed companies is low. Conversely, Chinese companies' P/E ratios are much higher than in the exchange markets of other developed countries (Ma, 2004; Wang and Cai, 2007). One possible explanation for the high P/E ratio in China post-2005 is that China launched a Small and Medium Enterprises board and a Growth Enterprises Market (GEM) board at the Shenzhen Stock Exchange in 2004 and 2009, respectively, which drives the P/E ratio of all of the companies listed on Chinese stock market.

Although it remains very small, management ownership increased from 0.0289% in 2005 to 12% in 2012, which shows that Chinese listed companies have adopted more equity-based executive compensation. This trend is consistent with that shown in the

previous literature (e.g., Li et al., 2013).

The average ownership of the largest shareholder showed a small decrease, from 40.8% in 2005 to approximately 36% in later years. This decrease may be because of the 2005 split-share reform. However, further study (which this thesis does not report here) shows that SOE companies' average single largest shareholder's ownership is dominant (Firth et al., 2007) and higher than that for all listed companies, as the biggest shareholder of listed SOEs is typically the government. This finding indicates that government continues to exercise tight control over publicly listed companies.

Independent directors play a very important role in corporate governance. In 2001, the CSRC released "Guidelines for establishing an independent director policy in publicly listed companies," which required that by the end of June 30, 2003, independent directors should comprise at least two thirds of the boards of all listed companies. IDRATIO increased very slowly from 0.3475 in 2005 to 0.3691 in 2012; moreover, the values of IDRATIO in all years are very close to 0.333, which is CSRC's minimum required independent-director ratio. This value is lower than the independent-director ratio in other markets, such as the US (Core et al., 1999), Great Britain (Ezzamel and Watson, 1997), and Hong Kong (Firth et al., 1999). This result may reveal that the major reason that listed Chinese companies have increased the number of independent directors is to comply with the CSRC's regulation, not to improve corporate governance (Fang and Zhang, 2013).

In general, CEO duality increased from 2005 to 2012, especially between 2006 and 2007. Because CEO duality enables more effective control of the board (Jensen, 1993) and helps build a clear strategy and mission (Anderson and Anthony, 1986), one possible explanation for the increased CEO duality ratio is that shareholders attempted to increase their control after split-share reform.

Below, Table 2.4 shows the variance inflation factors of independent variables. None

of these VIF is bigger than 2. So this indicates that multicollinearity is not significant and that it is unnecessary to provide special treatment.

[Table 2.4]

2.7.2 Results

2.7.2.1 Result: The market-determined compensation model

In step 1, the thesis conducted three regressions based on fixed-effects data panel models⁴. The independent variables in the first regression are LNSIZE, ROA, PERATIO, EXESHARE, IDRATIO, and CEODUAL as proxies to reflect the characteristics of firm size, accounting firm performance, and corporate governance.

In the second regression, this thesis added GROSSM, MBRATIO, LEVER, SHARECON, COMPANYAGE (substitution of executive tenure), and industry dummy variables (DUMIND*). The thesis finds that PERATIO and EXESHARE are not significant. IDRATIO is positive related to executive compensation. The reasons that the independent-director ratio is positively related to executive compensation might be that the average independent-director ratio is close to the minimum requirement of the CSRC regulation and that the director-election process is influenced by the CEO (Ghosh and Sirmans, 2005); thus, independent directors do not perform the necessary monitoring of CEO compensation or even support to offer executives higher compensation. This finding is consistent with the previous literature (Finkelstein and Hambrick, 1989; Conyon and Peck, 1998; Du and Zhai, 2005).

The thesis then removed variable PERATIO and EXESHARE from model 3, which is

⁴ A Hausman test is conducted to check whether fixed effect model or random effect model should be deployed.

H0: difference in coefficients between fixed effect and random effect model is not systematic

Chi2(9)=802.51; Prob>chi2 = 0.0000. So fixed effect model should be selected.

not significant in model 2 but includes these two variables in model 4 because models is conducted in Non-SOEs in which the companies may have different relation between executive compensation and firm's financial indexes or corporate governance attributes.

In the fourth regression, this thesis retained observations only if SOETAG does not equal 1, namely, observations from non-SOE solely. The significance of this model is that the thesis uses executive compensation in non-SOE listed companies as a benchmark to build a market-determined compensation model, which this thesis then uses to predict listed SOE executive compensation. Note that the number of observations in regression four is much smaller than in the first three regressions because in regression 4, only non-state companies are left as samples. Because most of the coefficients of regressions 3 and 4 are similar except for industry dummy variables, the thesis does not provide a detailed description of the coefficients of regression 4.

Below table 2.5 shows the results of above mentioned regressions.

[Table 2.5]

This thesis uses the outputs of model 3 to perform the following steps of the study. The thesis also uses model 4 to verify the results based on model 3 in the robustness test.

The coefficient of LNSIZE is significantly and positively related to executive compensation. This finding supports the argument that executives who manage larger companies generally have higher compensation, a conclusion that is consistent with many previous studies (e.g., Galbraith, 1973; Agrawal and Walking, 1994; Jones and Kato, 1996; Firth et al., 2006; Yang, 2004; Wan at al., 2008; Luo, 2009).

Return of Assets (ROA), as a proxy of firm performance, has significant relation with executive compensation. Gross margin (GROSSM) is another proxy of firm performance that focuses on profitability: the coefficient is 0.65, and the t value is 13.25. This result shows that gross margin is significantly and positively related to executive compensation and that its influence is strong. In General, firm performance has a positive relation to executive compensation in my regression. This result supports the argument on the positive relation between firm performance and executive compensation in many recent studies of Chinese listed companies (Conyon and He, 2011; He et al., 2013; Luo and Pang, 2014)

Not consistent with the predication that there is a negative relation between P/E ratio and executive compensation, the P/E ratio is positively related to executive compensation in this regression, however its coefficient is insignificant. The result indicates that executives generally have higher compensation in companies that have a relatively higher P/E ratio. The P/E ratio reflects a firm's long-term growth capability (Zarrowin, 1990; Kim and Koveos, 1994; Ramcharan, 2002), and companies listed on the SME and GEM boards generally have much higher P/E ratios than those of companies on the main board (Chen and Zhang, 2011). To grow the business, these SMEs may offer higher compensation to attract top managers. This observation may explain the positive relation between P/E ratio and executive compensation that is revealed by the regression.

Coefficient of market-to-book ratio (MBRATIO) is significantly and negatively related to executive compensation in model 2, 3 and 4 which is opposite to the prediction. Market-to-book ratio is considered as the best proxy variable to indicate firm's investment opportunity (Adam and Vidhan, 2008). Some previous literatures argue that there is a positive relation between executive compensation and firm's investment opportunity or growth opportunity (e.g.: Zhao et al., 2007; Xie and Hu, 2011), however the result of this study does not support the argument. Although it is not the focused field of this thesis and thus it is not reported completely, two

separated regressions for all SOEs and all Non-SOEs have been conducted to investigate above relation within different sample sets. The results of the two regressions show that there is a positive relation between market-to-book ratio and executive compensation in SOEs but the relation is negative in non-SOEs. Such relations are all significant. Considering that this study only counts cash income as executive compensation while does not include equity-based income in executive compensation, the above finding may be explained by the management ownership difference between SOEs and Non-SOEs. Very few executives hold ownership in SOEs while many more executives in Non-SOEs are granted firm's stock or options.

The asset-liability ratio (LEVER) has a positive impact on executive compensation in model 2 and model 3 and is significant at 99% level. Moreover asset-liability ratio also shows a positive and significant relation with executive compensation in Non-SOE firms. Consider normally Chinese listed SOE firms can not be bankrupted because of intervene from the government while private listed firms do not have such privileges. This result is consistent with Chemmanur et al.'s (2013) empirical study and supports Berk et al.'s (2010) argument that companies with high leverage will provide higher compensation to their employees to compensate for the risk of bankruptcy or takeover by external investors.

There are two variables that reflect ownership structure in the regression: EXESHARE is the proxy for management ownership, whereas SHARECON represents block holders' ownership status. EXESHARE is not significant while SHARECON is significant at 0.01 level. In addition, and consistent with substitute effect theory, the result shows a negative relation between management ownership and executive compensation, supporting the argument that management ownership has a substitutive effect on compensation thus the management may accept relatively lower cash compensation. This finding is consistent with some previous studies (e.g., Cordeiro and Veliyath, 2003; Hu et al., 2012) but not with other studies (e.g., Sanders, 2001a; Peng 2006; Zhang, 2010) whose findings support the agency theory and argue

that management ownership helps managers influence compensation decisions more effectively so that managers with higher ownership will receive higher compensation. The regression also presents a negative and significant relation between block holder ownership and executive compensation. This result complies with agency theory's suggestion that block holders with higher ownership will engage in more activity to monitor executive behaviors and control executive compensation (e.g., Hartzell and Starks, 2003; Haid and Yurtoglu, 2006; Ozkan, 2007); it is also consistent with some recent empirical studies of Chinese listed companies (i.e., Ke and Qiu, 2009; Conyon and He, 2011; Zhou, 2013).

As expected, CEO duality (CEODUAL) is positively related to executive compensation, thus supporting the argument that CEOs that hold dual positions will have more influence on the board of directors with respect to compensation decisions and that they will receive higher compensation. This result is consistent with recent researches (i.e., Wei and Sun, 2010; Xu and Li, 2011; Hu et al., 2012). However the results show that the coefficient of CEO duality is insignificant in all samples but significant in all NON-SOEs. The finding indicates that the compensation setting in SOEs may not be influenced by CEO and chairman much, compensation is more set by government according to the administrative ranks.

The thesis uses duration after a firm's IPO (COMPANYAGE) as a proxy for CEO tenure. According to some studies (e.g., Attaway, 2000; Luo, 2009), the longer a CEO's tenure is, the higher his or her compensation. The results of regressions in this study support the argument and show that there is a positive and significant relation between executive compensation and the time elapsed after a company goes public.

Different industries show different levels of influence on executive compensation. The regression result shows that the real estate and utility industries have a significant and negative influence on executive compensation, whereas the wholesale and retail industries have a significant and positive influence on executive compensation. The

manufacturing industry is also negatively related to executive compensation, but this relationship is not significant.

The third regression model has an F value of 657.37 and the R-squared equals to 0.3725. Overall, this means that the model is effective and meaningful with good explanatory capability to reflect executive compensation based on the selected independent variables in the model.

The fourth regression is conducted on the samples containing non-state-owned companies only. It is apparent that most of the model's coefficients have similar signs and significance levels as model 3, except for the industry dummy variables. This is understandable because observations from listed SOEs occupy more than 50% of the total observations, and SOEs dominate some industries, such as utilities and metallurgy. When all SOE observations are deleted from the sample set, the industry characteristics of the entire market will inevitably change.

2.7.2.2 Result: Prediction of market-determined compensation and the compensation gap

Based on the above regression from step 1, the thesis makes a prediction of market-determined executive compensation, named $COMPEN_{\text{market}}$, and this thesis then uses $COMPEN_{\text{market}}$ to subtract $COMPEN_{\text{actual}}$ to obtain $COMPEN_{\text{gap}}$, which is the difference between the market-determined compensation level and each company's actual executive compensation. If $COMPEN_{\text{gap}} > 0$, then actual executive compensation is regulated and lower than the market level; if $COMPEN_{\text{gap}} < 0$, then actual executive compensation is higher than the market-determined compensation level and executives are overpaid. The thesis lists detailed information about $COMPEN_{\text{gap}}$ in Table 2.6.

[Table 2.6]

From the results of either model 3 or model 4, it can be found that underpayment occurs in both SOE companies and non-SOE companies. In both models, the underpayment ratio of SOE observations is higher than that of non-SOE observations. This result indicates that underpayment—i.e., compensation regulation—is more prevalent in SOEs than in non-SOE companies. A prominent difference between the outputs of model 3 and model 4 is that the underpayment ratio of SOE observations increases disproportionately from 48.37% in model 3 to 51.83% in model 4. Because the thesis uses non-SOE companies to substitute for the overall market in model 4, this result indicates that the market-determined compensation level based on purely non-SOE listed companies is higher than the level based on all listed companies. The result is consistent with hypothesis that executive compensation in SOE companies is generally below market; here, the thesis uses all listed companies and all non-SOE listed companies as a proxy in model 3 and model 4 respectively.

2.7.2.3 Result: Verification of SOE attribute and the compensation gap

In the previous steps, the thesis has obtained the difference in executive compensation between market-determined compensation and actual compensation. The thesis then run regressions, using both model 3 and model 4, between $COMPEN_{gap}$ and $SOETAG$, $CENTRALSOE$, and $LOCALTAG$ with firm's corporate governance variables controlled. Detailed results are listed below in Tables 2.7 and 2.8, which are based on models 3 and 4, respectively.

Table 2.7 reports six regressions. Regression 1 ($GAPSOE_1$) is a pooled panel data regression between $EXECOM_{gap}$ and $SOETAG$ that intends to check whether SOE attribute has a positive relation with the executive compensation gap.

[Table 2.7]

The result of regression 1 shows that SOETAG is significantly and positively related to $EXECOM_{gap}$. This result both supports Hypothesis 1 and indicates that executives in listed SOEs will have a larger compensation gap between the market level and actual level; furthermore, SOE executive compensation is generally regulated to a below-market level. Regression 2 further investigates the relation between the compensation gap and SOE attributes, including central SOEs (CENTRALSOE) and local SOEs (LOCALTAG). The results show that both CENTRALSOE and LOCALTAG are positively related to $EXECOM_{gap}$, which can be interpreted to mean that compensation regulation occurs in all SOE companies. Both coefficients of CENTRALSOE and LOCALTAG are significant at the 0.01 level. Another finding from regression 2 is that the coefficient of CENTRALSOE is larger than the coefficient of LOCALTAG. Because both coefficients are positive, this means that central SOEs have stricter compensation regulation than local SOEs, as CENTRALSOE will cause a larger and positive gap between market-determined compensation and actual compensation.

Regression 3 and 4 are conducted among observations in which $EXECOM_{gap} \geq 0$. The purpose of these two regressions is to verify SOE attribute and the executive-compensation gap in companies that executives are underpaid. The result of regression 3 shows a significant and positive relation between SOETAG and $EXECOM_{gap}$, which indicates that in companies that practice compensation regulation, SOE attribute is a significant factor in both causing and increasing such regulations. Like regression 2, model 4 presents positive coefficients of CENTRALSOE and LOCALTAG, which consistently shows that both central and local SOEs practice compensation regulation. Similar to regression 2, the coefficient of CENTRALSOE is significant at the 0.01 level.

The F values of regression from one to four are significant, indicating that the models

are both meaningful and effective.

Regression 5 and 6 are conducted among observations in which $EXECOM_{gap} \leq 0$. The purpose of these two regressions is to verify SOE attribute and the executive-compensation gap in companies that executives are overpaid. The results of regression 5 and regression 6 show negative relations between SOE attributes and $EXECOM_{gap}$, however all coefficients are not significant. Meanwhile F values of regression 5 and regression 6 are very small. The results do not indicate any clear relation between SOE attributes and $EXECOM_{gap}$.

One point that must be highlighted is that all of the regressions' R-squared values are relatively small. This could be because the executive compensation gap between market-determined and actual compensation is related to many factors. This thesis, however, only focuses on SOE attribute while omitting all other possible influences. Small R-squared values do not affect the conclusion about the relation between $EXECOM_{gap}$ and SOE attribute.

[Table 2.8]

Table 2.8 presents results based on model 4, which uses non-SOE listed companies as a proxy for the market. On the contrast, the results discussed above are based on model 3, which uses all listed companies as a proxy for the market. All outputs listed in Table 2.8 are similar to those listed in Table 2.7. SOETAG has a significant and positive relation with $EXECOM_{gap}$, both CENTRALSOE and LOCALTAG positively impact $EXECOM_{gap}$, and unlike Table 2.7, the coefficient of CENTRALSOE now becomes significant. Table 2.8 also reports almost the same results as Table 2.7 for the variable set in which the $EXECOM_{gap} \geq 0$ and $EXECOM_{gap} < 0$.

2.7.3 Robustness test

This thesis performs two robustness tests to verify the results discussed above. In the first test, the thesis substitutes the variable of Market-to-book ratio with Tobin's Q. Tobin's Q is a proxy of firm's investment opportunities and has been used in many previous empirical studies (e.g., Narayanan, 1988; Vogt, 1994; Richardson, 2006). The thesis also substitutes the ROA with Operating Profit Ratio (OPR) to measure firm's operational performance. The regression results are listed in Table 2.9. Model 1 presents the results of original regression, and model 2 reports the results of new regression with Tobin's Q and OPR as proxy for investment opportunity and operational performance respectively.

[Table 2.9]

The results show that except for industry dummy variables, all other independent variables retained the same coefficient signs as in model 2. In addition, model 2 has a higher R-squared value than model 1. This thesis then makes predictions based on this new model and check the relation between $EXECOM_{gap}$ and SOE attribute with corporate governance control variables. Table 2.10 shows the details.

[Table 2.10]

For all samples, SOETAG remains significantly and positively related to $EXECOM_{gap}$, which again supports Hypothesis 1. The results are also same as before when regressions are conducted within samples in which $EXECOM_{gap} \geq 0$ and $EXECOM_{gap} \leq 0$. The coefficients of SOETAG, CENTRALSOE and LOGTAG remain insignificant in the regression 5 and 6. Thus the conclusions drew from two models are same. The results also show that the study is robust by replacing two important control variables.

Thus far, all predictions of executive compensation in this study so far are based on panel data fixed-effects models. It is understandable that executive compensation is highly influenced by its figure in previous years. So the thesis introduces a one-order-difference dynamic panel data model. However in a dynamic panel data model, lagged values of dependent variable work as an independent variable in the regression. Thus regression residues are related to independent variables or explanatory variables. This is a heteroscedasticity problem. According to Arellano and Bond (1991) and Blundell and Bond (1998) a GMM (Generalized Method of Moments) estimator of dynamic panel data model has the ability to solve above mentioned heteroscedasticity problem. Meanwhile, Windmeijer (2005) argues that a two-step bias-corrected system GMM estimation can produce a better statistical inference. In the second robustness test, this thesis changes the regression model from a fixed effects panel data model to a two-step system GMM of dynamic panel data model. Table 2.11 shows a detailed comparison of the fixed effects panel data model and the system GMM dynamic panel data model.

[Table 2.11]

The thesis then uses the dynamic panel data model to make the prediction and check the relation between $EXECOM_{gap}$ and SOE attribute with firm's corporate governance control variables, both in all observations and in observations in which $EXECOM_{gap} \geq 0$ and $EXECOM_{gap} \leq 0$ only. The results are shown in Table 2.12.

[Table 2.12]

Results show that there are no differences between the two models. Table 2.12 indicates that all of the signs of the coefficients are the same as the results of the fixed-effects panel data model listed in Table 2.7. Thus, the results based on dynamic panel data system GMM (DPD-GMM) model fully support hypothesis 1 that the SOE attribute of a firm is positively related to the compensation gap between the market-determined executive compensation level and actual executive compensation.

To summarize, the results from the above two robustness tests comply with original findings and support the first hypothesis that SOE attribute is positively related to the gap between the market-determined executive compensation level and actual executive compensation in SOEs.

2.8 Conclusion and Discussion

Some hotly debated issues in the field of top management address whether publicly listed companies, especially state-owned listed companies, offer overly high compensation to their executives and whether such compensation is related to firm performance and corporate governance. These questions are important in China because China is still engaged in economic reforms and the Chinese government is encouraging Chinese SOEs to adopt modern corporate governance policies to improve firm performance. Both the public and the authorities are paying a great deal of attention to executive compensation. On the one hand, the public is arguing that executives in listed companies have much higher compensation than non-managerial employees, which is unfair both because these executives do not provide benefits to small shareholders and because SOE listed companies are owned by all Chinese people, given them natural competitive advantages and privileges. Therefore, executives in SOEs do not deserve high compensation. On the other hand, authorities believe that compensation is an incentive that motivates executives to pursue better firm performance and that market-level compensation will help traditional SOEs transition to modern firms. However, because Chinese political reform lags far behind economic reform, most executives in large SOEs continue to hold positions within the administrative hierarchy; accordingly, very high executive compensation in SOEs will lead to administrative problems. In addition, to build a harmonious society, the government needs to consider public opinion. This creates a dilemma for the Chinese government, which must balance SOE reforms and the conventional administrative structure to achieve a genuine breakthrough in political reforms.

This study provides some useful suggestions to solve the problems set forth above. According to the empirical study, firm size remains the most important factor in setting executive compensation. ROA is positively but not significantly related to executive compensation, and gross margin is significantly and positively related to executive compensation. This finding shows that to some degree, firm performance influences compensation decisions; however, short-term measures (gross margins) play a more important role than relatively long-term measures (ROA) in establishing compensation. Corporate governance remains weak in Chinese listed companies. Independent directors are not playing an effective monitoring role, and CEO duality remains prevalent, which influences executive compensation decisions and causes higher compensation overall. Ownership structure has a significant impact on executive compensation. Consistent with substitute effect theory, the result shows a negative relation between management ownership and executive compensation, supporting the argument that management ownership has a substitutive effect on compensation thus the management may accept relatively lower cash compensation. This finding is consistent with some previous studies (e.g., Cordeiro and Veliyath, 2003; Hu et al., 2012) but not with other studies (e.g., Sanders, 2001a; Peng 2006; Zhang, 2010) whose findings support the agency theory and argue that management ownership helps managers influence compensation decisions more effectively so that managers with higher ownership will receive higher compensation. However such relation is not significant in this research which may because management ownership in Chinese listed companies is not prevalent yet. Ownership concentration (SHARECON) is significantly and negatively related to executive compensation according to both my study and findings from other authors (e.g., Ke and Qiu, 2009; Conyon and He, 2011; Zhou, 2013). This result shows that block holders in Chinese listed companies not only play an effective role in monitoring management but also control the cash compensation of executives.

Another important finding of this study is the relation between SOE attribute and executive compensation. The thesis finds that SOE attribute (whether central or local)

increases the gap between executives' actual compensation and market-determined compensation. This finding supports the hypothesis and shows that compensation regulation not only occurs in SOE listed companies but also may drive executive compensation lower than the market level. The implications of this finding are important. First, it reminds policymakers that it may not be the right decision to simply control executive compensation in SOEs, as the Chinese government is now doing, because compared to market-level compensation, executive compensation in SOEs is already low. Second, to motivate SOE executives, policy makers may rely more heavily on equity-based incentives. Perhaps one proper method of motivating executives in SOEs could be to keep their current cash compensation constant while increasing their equity-based compensation as a portion of total compensation. Third, because most listed SOEs are ultimately state-controlled, the state normally is the single biggest shareholder. This ownership structure not only causes relatively lower executive compensation but also distorts corporate governance, resulting in a low independent-director ratio, for example. One possible way to conduct further SOE reforms would be to dilute state ownership (Chen et al., 1998; Firth et al., 2006) so that the board can truly take responsibility for protecting shareholders.

In this study, the thesis only analyzes executive cash compensation because although equity-based compensation is increasing, it currently remains a small portion of total compensation. Equity incentives will be an important aspect of future total compensation packages; therefore, future studies should focus on equity-based compensation. Another possible improvement on the research would be to find a proxy for the overall market. Because of data constraints, this thesis uses all listed companies as a substitute for the overall market. The thesis also attempts to use all non-SOE listed companies as a proxy. However, because listed companies have some similar features—especially under China's current IPO policy—there might be some bias if the study were to use all listed companies as a proxy of the overall market. The best way to resolve this issue would be to rely on data from a sufficient number of listed and privately held companies. Finally, further research can more closely

examine the differences between central SOEs and local SOEs, which have different attributes in this study.

Table 2.1 Variable definitions for regression to build executive compensation model

Variable	Name	Definition
Executive Cash Compensation (Dependent Variable)	LNEXECOM	Natural log of total cash compensation of all top executives in the firm
<i>Operating Characteristics</i>		
Company Size	LNSIZE	Natural log of firm total assets
P/E Ratio	PERATIO	(Stock price)/(Earnings per share)
Market-to-Assets Ratio	MBRATIO	(Market value)/(Total assets)
Finance Leverage	LEVER	Debt/(Total assets)
Publicly listed duration	COMPANYAGE	Natural log of total years since IPO
<i>Firm Performance</i>		
Gross Margin	GROSSM	(Gross profit)/(Operating revenue)
Return on Assets	ROA	(Profit)/(Total assets)
<i>Corporate Governance</i>		
Management Ownership	EXESHARE	(Management ownership)/(Total ownership)
Blockholder	SHARECON	(Ownership of the largest shareholder)/(Total ownership)
Independent Director Ratio	IDRATIO	(Num. of independent directors)/(Num. of all directors)
CEO Duality	CEODUAL	Dummy Variable, 1: CEO and Chairman are the same person; 0: CEO and Chairman are two persons
<i>Industry Attributes</i>		
Industry Dummy	DUMIND*	Refer to below note

This table presents dependent and independent variables for the regression to predicate executive compensation of Chinese listed companies. The model contains independent variables from four categories: firm operating characteristics, firm financial performance, firm corporate governance attributes and industry attributes.

Below letters present the different industry for industry dummy variables.

A: Agriculture; B: Oil and Gas; C: Manufacturing; D: Power and Utilities; E: Construction; F: Wholesale and Retail; G: Transportation and Logistics; H: Lodging; I: Information Technology; K: Real Estate; L: Commercial Services; M: R&D and Technical Services; N: Water and Environment; O: Residential Services; P: Education; Q: Health; R: Culture, Sports, Entertainment; S: Conglomerate.

Table 2.2 SOE attribute variables

Variable	Name	Definition
State-Owned Enterprise Attribute 1	SOETAG	1: the actual controller of the firm is state-owned 0: the actual controller of the firm is NOT state-owned
State-Owned Enterprise Attribute 2	CENTRALSOE	1: the actual controller belongs to the central government 0: the actual controller does NOT belong to the central government
State-Owned Enterprise Attribute 3	LOCALTAG	1: the actual controller belongs to the local government or another SOE 0: the actual controller does NOT belong to the local government or another SOE

This table presents SOE attribute variables. SOETAG refers to the firms whose actual controlling shareholder is state-owned. CENTRALSOE refers to the firms whose controlling shareholder is the central government or its affiliates such as CSRC. LOCALTAG refers to firms whose controlling shareholder is local government or another SOE.

Firm's actual controller information can be found in segment "S0702b" of the CSMAR database. A detailed description can be obtained from the "User's manual of the Shareholder Research Database of Chinese Listed Companies—2013 Edition" (GTA, 2013).

Table 2.3 Descriptive statistics

Variable	Year	No. of Obs.	Mean	Std.Dev.	Min	Max
execom	All	12260	2908000	3281000	14800	120000000
	2005	1177	1510597	1526498	28800	17500000
	2006	1221	1753130	1817661	31200	19600000
	2007	1298	2273927	2580127	14800	29500000
	2008	1343	2543462	2723487	48500	28100000
	2009	1419	2802408	2811675	105000	30300000
	2010	1691	3267095	3309997	51600	37000000
	2011	1891	3765240	4482367	103990	120000000
	2012	2220	3941417	3696007	132000	52200000
size	All	12263	7550000000	46500000000	51134	217000000000
	2005	1178	3700000000	17100000000	39200000	521000000000
	2006	1221	4360000000	19600000000	20400000	595000000000
	2007	1300	6340000000	36600000000	1408532	994000000000
	2008	1343	7270000000	42400000000	51133.68	1190000000000
	2009	1419	8300000000	49300000000	4963990	1450000000000
	2010	1691	8640000000	51600000000	949127.5	1660000000000
	2011	1891	9310000000	56400000000	6683503	1920000000000
	2012	2220	9420000000	58400000000	6779589	2170000000000
grossm	All	12263	0.249	0.178	-1.812	1
	2005	1178	0.2222631	0.1781754	-1.812309	0.999417
	2006	1221	0.2285505	0.1658172	-0.551485	0.949938
	2007	1300	0.2388038	0.1628257	-.42353	1
	2008	1343	0.2314923	0.1795595	-0.634729	1
	2009	1419	0.2446605	0.1879121	-1.505507	1
	2010	1691	0.2651312	0.1744162	-0.398079	1
	2011	1891	0.264432	0.1793176	-0.515049	1
	2012	2220	0.2674378	0.1825219	-0.64943	0.963101
ROA	All	12263	0.0412	0.250	-6.000	20.79
	2005	1178	0.0061667	0.1176603	-1.68061	0.262006
	2006	1221	0.0258768	0.1035496	-1.122114	0.888748
	2007	1300	0.0591652	0.3164631	-0.796958	10.53025
	2008	1343	0.0295586	0.2149565	-3.774665	5.074266
	2009	1419	0.0345127	0.1433929	-3.001192	1.997056
	2010	1691	0.0525797	0.1812606	-5.999601	2.933009
	2011	1891	0.0602963	0.4862971	-0.86044	20.78764
	2012	2220	0.0441936	0.0765308	-0.857696	1.089521
peratio	All	12263	104.7	254.2	0.722	9044
	2005	1178	71.98406	128.9251	2.086207	1820
	2006	1221	96.56025	194.8234	1.23115	2554.545
	2007	1300	132.6126	278.2189	1.23115	5903.226
	2008	1343	105.8072	312.5286	1.711297	9044.118
	2009	1419	157.2704	345.0002	1.711297	5721.429

mbratio	2010	1691	123.1802	297.8479	2.656489	5721.429
	2011	1891	82.05116	185.4531	0.721905	2760.606
	2012	2220	81.39105	214.4184	0.721905	3740
	All	12255	3.032	106.4	0.283	11628
	2005	1178	1.082188	0.5463417	0.4012877	13.72947
	2006	1220	1.284206	0.4966365	0.5860191	7.458735
	2007	1299	2.742254	13.48142	0.8495354	481.0005
	2008	1340	10.11392	317.6186	0.5396369	11627.91
	2009	1416	2.738943	10.48783	0.8404138	389.2565
	2010	1691	3.570322	42.21885	0.7569003	1736.111
lever	2011	1891	1.919788	4.671133	0.7002085	174.9169
	2012	2220	1.648722	3.989761	0.2832386	172.503
	All	12262	0.551	2.207	0.00708	142.7
	2005	1178	0.6064219	1.392251	0.034754	43.07538
	2006	1221	0.5750368	0.5338036	0.020667	7.978952
	2007	1300	0.6872873	3.855987	0.009122	124.0223
	2008	1343	0.7334589	4.759018	0.018299	142.7178
	2009	1418	0.6026907	2.005252	0.017795	55.40864
	2010	1691	0.4745695	0.674568	0.010827	18.93984
	2011	1891	0.4447304	0.373839	0.00708	6.68446
exeshare	2012	2220	0.4313642	0.4752324	0.011034	12.12736
	All	12263	0.0529	0.148	0	0.891
	2005	1178	0.000289	0.0078955	0	0.2708941
	2006	1221	0.001982	0.0216304	0	0.5019231
	2007	1300	0.0038214	0.0339075	0	0.54405
	2008	1343	0.0108567	0.0653911	0	0.7476636
	2009	1419	0.0297475	0.110462	0	0.7476636
	2010	1691	0.0756116	0.1731342	0	0.0891
	2011	1891	0.1001869	0.1942533	0	0.82125
	2012	2220	0.1200612	0.2058777	0	0.8191875
sharecon	All	12263	36.46	15.23	0.820	88.55
	2005	1178	40.89772	16.18421	4.24	84.98
	2006	1221	36.22892	14.72939	4.54	83.75
	2007	1300	35.89302	14.84613	0.82	86.29
	2008	1343	36.24719	14.94184	3.74	86.42
	2009	1419	35.76044	15.05934	3.64	86.2
	2010	1691	35.86677	15.15193	3.5	86.49
	2011	1891	35.7264	15.05613	2.197	86.49
	2012	2220	36.19621	15.33668	2.197	88.55
	All	12257	1.76	1.147	-5.900	3.093
companyage idratio	All	12263	0.362	0.0507	0.0833	0.714
	2005	1178	0.3475867	0.0459189	0.0833333	0.6
	2006	1221	0.3516982	0.0447563	0.1111111	0.5714286
	2007	1300	0.3579756	0.0461477	0.1428571	0.6666667

	2008	1343	0.3602698	0.050318	0.1428571	0.6
	2009	1419	0.3627517	0.0504298	0.0909091	0.5714286
	2010	1691	0.3650047	0.0513325	0.125	0.625
	2011	1891	0.3678732	0.0534499	0.2	0.7142857
	2012	2220	0.3691721	0.053598	0.2222222	0.7142857
CEODUAL	All	12263	0.192	0.394	0	1
	2005	1178	0.1154499	0.3196999	0	1
	2006	1221	0.1269451	0.3330479	0	1
	2007	1300	0.1546154	0.3616768	0	1
	2008	1343	0.1563663	0.3633376	0	1
	2009	1419	0.1775899	0.3823018	0	1
	2010	1691	0.211709	0.4086405	0	1
	2011	1891	0.2443152	0.4297941	0	1
	2012	2220	0.2594595	0.4384368	0	1

Note:

- Execom is total cash compensation of all top executives in the form. Unit is CNY.
- Size denotes firm size which is firm's total assets. Unit is CNY.
- PERATIO is ratio of stock price and earning per share, defines as: (Stock price)/(Earnings per share)
- MBRATIO is ratio of firm's market value and book value, defined as: (Market value)/(Total assets)
- LEVER denotes the debt ratio, namely, debt is divided by firm's total assets
- Companyage is Natural log of total years since firm IPO
- GROSSM denotes firm's operating margin, defined as: (Gross profit)/(Operating revenue)
- EXESHARE denotes executives' ownership, calculated as: (Management ownership)/(Total ownership)
- SHARECON denotes firm's ownership concentration percentage, defined as: (Ownership of the largest shareholder)/(Total ownership) *100%
- IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents descriptive statistics of the variables in the regression. To promote better understanding, the thesis presents the original data for executive compensation, company size (value of total assets), and revenue per share instead of their natural logarithm types.

Table 2.4 Variance Inflation Factor

Variable	VIF	1/VIF
lnsize	1.21	0.828075
grossm	1.10	0.911408
ROA	1.08	0.909236
peratio	1.06	0.942222
mbratio	1.62	0.616528
lever	1.67	0.597937
exeshare	1.44	0.695941
sharecon	1.12	0.889075
idratio	1.02	0.985221
CEODUAL	1.10	0.911519
companyage	1.48	0.675771
Mean VIF	1.26	

Note:

- a) Execom is total cash compensation of all top executives in the form.
- b) Lnsize denotes firm size which is natural log of firm's total assets.
- c) PERATIO is ratio of stock price and earning per share, defines as: $(\text{Stock price})/(\text{Earnings per share})$
- d) MBRATIO is ratio of firm's market value and book value, defined as: $(\text{Market value})/(\text{Total assets})$
- e) LEVER denotes the debt ratio, namely, debt is divided by firm's total assets
- f) Companyage is Natural log of total years since firm IPO
- g) GROSSM denotes firm's operating margin, defined as: $(\text{Gross profit})/(\text{Operating revenue})$
- h) EXESHARE denotes executives' ownership, calculated as: $(\text{Management ownership})/(\text{Total ownership})$
- i) SHARECON denotes firm's ownership concentration, defined as: $(\text{Ownership of the largest shareholder})/(\text{Total ownership})$
- j) IDRATIO is ratio of firm's independent directors, defined as: $(\text{Num. of independent directors})/(\text{Num. of all directors})$
- k) CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents the variance inflation factors of independent variables of regression to measure executive compensation. None of these VIF is bigger than 2. So this indicates that multicollinearity is not significant and that it is unnecessary to provide special treatment.

Table 2.5 Results of Fixed effects panel data regression to measure executive compensation

VARIABLES	Predicated Sign	(Model 1)	(Model 2)	(Model 3)	(Model 4)
		Fixed effects	Fixed effects	Fixed effects	Fixed effects
		Panel_1 lnexecom	Panel_2 lnexecom	Panel_3 lnexecom	Panel_4_NON SOE lnexecom
lnsize	+	0.571*** (64.87)	0.511*** (55.09)	0.511*** (55.18)	0.471*** (34.25)
ROA	+	0.0991*** (5.930)	0.0641*** (3.865)	0.0640*** (3.860)	0.0346** (2.207)
grossm	+		0.658*** (13.24)	0.657*** (13.25)	0.521*** (8.297)
peratio	-	0.0000230 (1.251)	0.00000413 (0.235)		0.0000323 (1.370)
mbratio	+		-0.000176*** (-3.025)	-0.000176*** (-3.029)	-0.000166*** (-3.100)
lever	+		0.0212*** (6.561)	0.0212*** (6.556)	0.0201*** (6.634)
exeshare	+	0.0354 (0.349)	-0.0693 (-0.718)		-0.00756 (-0.0847)
sharecon	-		-0.0107*** (-15.31)	-0.0107*** (-15.35)	-0.0105*** (-9.067)
idratio	+	0.803*** (6.528)	0.537*** (4.575)	0.537*** (4.579)	0.430** (2.506)
CEODUAL	+	0.0152 (0.840)	0.00968 (0.560)	0.00951 (0.550)	0.0549*** (2.595)
companyage			0.154*** (21.67)	0.154*** (21.69)	0.125*** (16.15)
Industry effect		No	Yes	Yes	Yes
Constant		1.899*** (9.981)	3.242*** (16.48)	3.248*** (16.55)	4.345*** (14.91)
F Value		763.6	537.82	657.37	221.18
Observations		12,260	12,246	12,246	5,945
R-squared		0.3069	0.3725	0.3725	0.3585

Note: Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note:

- Execom is total cash compensation of all top executives in the form.
- Lnsize denotes firm size which is natural log of firm's total assets.
- PERATIO is ratio of stock price and earning per share, defines as: (Stock price)/(Earnings per share)
- MBRATIO is ratio of firm's market value and book value, defined as: (Market value)/(Total assets)

- e) LEVER denotes the debt ratio, namely, debt is divided by firm's total assets
- f) Companyage is Natural log of total years since firm IPO
- g) GROSSM denotes firm's operating margin, defined as: $(\text{Gross profit})/(\text{Operating revenue})$
- h) EXESHARE denotes executives' ownership, calculated as: $(\text{Management ownership})/(\text{Total ownership})$
- i) SHARECON denotes firm's ownership concentration, defined as: $(\text{Ownership of the largest shareholder})/(\text{Total ownership})$
- j) IDRATIO is ratio of firm's independent directors, defined as: $(\text{Num. of independent directors})/(\text{Num. of all directors})$
- k) CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm
- l) dumind* are dummy variables of different industries
- m) Since the regression is based on fixed-effects data panel, R-squared value reported in the table is within R^2 .

This table presents the results of four regressions based on fixed-effects panel data models to measure executive compensation. The independent variables in the first regression are LNSIZE, ROA, PERATIO, EXESHARE, IDRATIO, and CEODUAL as proxies to reflect the characteristics of firm size, accounting firm performance, and corporate governance. In the second regression, added GROSSM, MBRATIO, LEVER, SHARECON, COMPANYAGE (substitution of executive tenure), and industry dummy variables (DUMIND*) are added to the model. The variable PERATIO and EXESHARE are removed from model 3, which are not significant in model 2. The fourth model is conducted among observations only if SOETAG does not equal 1, namely, observations from non-SOE solely.

Table 2.6 Compensation Gap Results

Model 3 (Based on Full Obs.)	Value
Total number of obs.	12253
Number of non-SOE obs.	5946
Number of non-SOE obs. ($COMPEN_{gap} > 0$)	2786
Underpayment ratio among non-state obs.	46.85%
Number of SOE obs.	6307
Number of SOE obs. ($COMPEN_{gap} > 0$)	3051
Underpayment ratio among SOE obs.	48.37%
<hr/>	
Model 4 (Based on Obs. $\in \{SOETAG \neq 1\}$)	
use private firms as executive compensation benchmark	
Total number of obs.	12253
Number of non-SOE obs.	5946
Number of non-SOE obs. ($COMPEN_{gap} > 0$)	2859
Underpayment ratio among non-state obs.	48.08%
Number of SOE obs.	6307
Number of SOE obs. ($COMPEN_{gap} > 0$)	3269
Underpayment ratio among SOE obs.	51.83%

This table presents executive underpayment rate in Chinese listed companies. Model 3 uses all data from listed companies as executive compensation market level benchmark while model 4 uses data from non-SOEs as executive compensation market level benchmark.

Table 2.7 Verification between executive compensation Gap (EXECOMGAP) and SOE attribute – Model 3 (Market-determined level based on full samples)

	(1)	(2)	(3)	(4)	(5)	(6)
	GAPSOE_1	GAPSOE_2	GAPSOE_3	GAPSOE_4	GAPSOE_5	GAPSOE_6
VARIABLES	Execomgap-all	Execomgap-all	Execomgap>=0	Execomgap>=0	Execomgap<=0	Execomgap<=0
centralsoe		979,962*** (5.046)		0.000001725*** (8.436)		-300,543 (-1.081)
localtag		303,106*** (5.318)		133,926*** (3.429)		-22,347 (-0.253)
companyage	424,970*** (16.62)	425,523*** (16.64)	245,529*** (8.253)	257,168*** (8.900)	-15,673 (-0.478)	-15,262 (-0.466)
sharecon	5,490** (2.199)	5,145** (2.106)	20,442*** (8.358)	19,518*** (8.380)	-4,404 (-1.186)	-4,290 (-1.182)
idratio	650,554 (1.004)	499,470 (0.785)	0.000002711*** (3.866)	0.000002393*** (3.673)	-0.000001927** (-2.250)	-0.000001858** (-2.176)
CEODUAL	-344,122*** (-5.358)	-334,240*** (-5.233)	-250,326*** (-5.852)	-213,906*** (-4.941)	-11,112 (-0.131)	-13,574 (-0.161)
soetag	382,783*** (6.823)		313,027*** (7.606)		-56,667 (-0.667)	
Constant	-0.00000167*** (-6.271)	-0.00000161*** (-6.202)	-0.000001043*** (-3.690)	-929,301*** (-3.545)	-0.000001045*** (-2.908)	-0.000001074*** (-3.058)
F Value	134.96	112.42	65.85	57.16	1.47	1.25
Observations	12,253	12,253	5,923	5,923	6,330	6,330
R-squared	0.046	0.048	0.060	0.105	0.002	0.002

Note: Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

This table presents regression results between executive compensation gap and firm ownership attributes. The executive compensation market level is based on all Chinese listed companies as the benchmark. The table reports six regressions. Regression 1 (GAPSOE_1) is an OLS regression between EXECOMgap and SOETAG that intends to check whether SOE attribute will increase the executive compensation gap. Regression 2 (GAPSOE_2) further investigates the relation between the compensation gap and SOE attributes, including central SOEs (CENTRALSOE) and local SOEs (LOCALTAG). Regression 3 and 4 (GAPSOE_3 and GAPSOE_4) are conducted among observations in which EXECOM_{gap}>=0. The purpose of these two regressions is to verify SOE attribute and the executive-compensation gap in companies that executives are underpaid. Regression 5 and 6 (GAPSOE_5 and GAPSOE_6) are conducted among observations in which

EXECOMgap \leq 0. The purpose of these two regressions is to verify SOE attribute and the executive-compensation gap in companies that executives are overpaid.

Note:

- a) Companyage is Natural log of total years since firm IPO
- b) SHARECON denotes firm's ownership concentration, defined as: (Ownership of the largest shareholder)/(Total ownership)
- c) IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- d) CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm
- e) R-squared value reported in the table is adjusted R^2 .

Table 2.8 Verification between executive compensation Gap (EXECOMGAP) and SOE attribute – Model 4 (Market-determined level based on non-SOE samples)

	(1)	(2)	(3)	(4)	(5)	(6)
	GAPSOE_1	GAPSOE_2	GAPSOE_3	GAPSOE_4	GAPSOE_5	GAPSOE_6
VARIABLES	Execomgap-all	Execomgap-all	Execomgap>=0	Execomgap>=0	Execomgap<=0	Execomgap<=0
centralsoe		827,961*** (4.452)		1,363,000*** (8.472)		-412,557 (-1.262)
localtag		308,957*** (5.445)		135,596*** (3.953)		-108,372 (-1.091)
companyage	405,747*** (16.03)	406,157*** (16.05)	257,765*** (12.71)	263,937*** (13.30)	-53,735 (-1.481)	-53,204 (-1.467)
sharecon	1,295 (0.530)	1,034 (0.432)	14,470*** (7.600)	13,900*** (7.591)	-2,733 (-0.637)	-2,574 (-0.619)
idratio	205,784 (0.330)	90,566 (0.147)	1,932,000*** (3.521)	1,667,000*** (3.219)	-2,432,000** (-2.515)	-2,361,000** (-2.453)
CEODUAL	-227,595*** (-3.549)	-220,126*** (-3.451)	-162,790*** (-4.356)	-141,600*** (-3.748)	36,431 (0.385)	32,942 (0.350)
soetag	370,060*** (6.657)		274,794*** (7.688)		-146,288 (-1.533)	
Constant	-1,129,000*** (-4.393)	-1,081,000*** (-4.307)	-522,514** (-2.358)	-424,510** (-2.038)	-882,527** (-2.169)	-913,475** (-2.305)
F Value	125.73	104.86	92.71	79.55	3.50	2.92
Observations	12,253	12,253	5,923	5,923	6,330	6,330
R-squared	0.040	0.042	0.057	0.092	0.003	0.004

Note: Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

This table presents regression results between executive compensation gap and firm ownership attributes. The executive compensation market level is based on all non-SOEs as the benchmark. The table reports six regressions. Regression 1 (GAPSOEM4_1) is an OLS regression between EXECOMgap and SOETAG that intends to check whether SOE attribute will increase the executive compensation gap. Regression 2 (GAPSOEM4_2) further investigates the relation between the compensation gap and SOE attributes, including central SOEs (CENTRALSOE) and local SOEs (LOCALTAG). Regression 3 and 4 (GAPSOEM4_3 and GAPSOEM4_4) are conducted among observations in which EXECOM_{gap}>=0. The purpose of these two regressions is to verify SOE attribute and the executive-compensation gap in

companies that executives are underpaid. Regression 5 and 6 (GAPSOEM4_5 and GAPSOEM4_6) are conducted among observations in which EXECOMgap \leq 0. The purpose of these two regressions is to verify SOE attribute and the executive-compensation gap in companies that executives are overpaid.

Note:

- a) Companyage is Natural log of total years since firm IPO
- b) SHARECON denotes firm's ownership concentration, defined as: (Ownership of the largest shareholder)/(Total ownership)
- c) IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- d) CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm
- e) R-squared value reported in the table is adjusted R².

Table 2.9 Sales revenue as measurement of company size to measure executive compensation-Robustness test

VARIABLES	Model 1: MBR & ROA	Model 2:TobinQ & OPR
	lnexecom	lnexecom
lnsize	0.511*** (55.18)	0.545*** (58.31)
ROA	0.0640*** (3.860)	
grossm	0.657*** (13.25)	0.545*** (11.08)
mbratio	-0.000176*** (-3.029)	
lever	0.0212*** (6.556)	0.0139*** (6.229)
sharecon	-0.0107*** (-15.35)	-0.00936*** (-13.55)
idratio	0.537*** (4.579)	0.432*** (3.730)
CEODUAL	0.00951 (0.550)	0.00406 (0.238)
companyage	0.154*** (21.69)	0.159*** (22.76)
OPR		0.0000026*** (3.307)
TobinQ		0.0557*** (17.16)
Constant	3.248*** (16.55)	2.384*** (11.90)
F value	657.37	706.07
Observations	12,253	12,253
R-squared	0.373	0.389

Note: Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- Lnrev is natural log of firm's sales revenue
- Lnsize denotes firm size which is natural log of firm's total assets.
- PERATIO is ratio of stock price and earning per share, defines as: (Stock price)/(Earnings per share)
- MBRATIO is ratio of firm's market value and book value, defined as: (Market value)/(Total assets)
- LEVER denotes the debt ratio, namely, debt is divided by firm's total assets
- Companyage is Natural log of total years since firm IPO
- GROSSM denotes firm's operating margin, defined as: (Gross profit)/(Operating revenue)

- h) EXESHARE denotes executives' ownership, calculated as: $(\text{Management ownership})/(\text{Total ownership})$
- i) SHARECON denotes firm's ownership concentration, defined as: $(\text{Ownership of the largest shareholder})/(\text{Total ownership})$
- j) IDRATIO is ratio of firm's independent directors, defined as: $(\text{Num. of independent directors})/(\text{Num. of all directors})$
- k) CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm
- l) dumind* are dummy variables of different industries
- m) TobinQ is Market Value/Total assets
- n) OPR is operating profit ratio, namely, $\text{operating profit}/\text{operating revenue}$

This table presents comparison between regressions based on different measures to firm operating profit performance and firm investment opportunity. Panel 1 presents the results of Market-to-book ratio as a proxy for firm investment opportunity and ROA as a proxy for firm operating performance. Panel 2 reports the results of Tobin's Q as a proxy for firm investment opportunity and OPR as a proxy for firm's operating performance.

Table 2.10 Verification between executive compensation Gap (EXECOMGAP) and SOE attribute – Robustness test (market-determined level based on full samples and Tobin’Q as firm investment opportunity and OPR for operating performance)

	(1)	(2)	(3)	(4)	(5)	(6)
	GAPSOE_1	GAPSOE_2	GAPSOE_3	GAPSOE_4	GAPSOE_5	GAPSOE_6
VARIABLES	Execomgap-all	Execomgap-all	Execomgap>=0	Execomgap>=0	Execomgap<=0	Execomgap<=0
centralsoe		1,170,000*** (5.813)		1,946,000*** (8.431)		-238,428 (-0.905)
localtag		279,928*** (4.860)		116,353*** (2.658)		-61.12 (-0.000707)
companyage	432,240*** (16.78)	432,943*** (16.80)	219,473*** (5.816)	234,163*** (6.332)	-22,899 (-0.707)	-22,522 (-0.695)
sharecon	12,375*** (4.721)	11,927*** (4.646)	28,670*** (9.363)	27,497*** (9.381)	-2,917 (-0.835)	-2,837 (-0.827)
idratio	516,514 (0.772)	318,921 (0.487)	2,713,000*** (3.497)	2,389,000*** (3.310)	-1,746,000** (-2.065)	-1,683,000** (-1.992)
CEODUAL	-363,828*** (-5.635)	-351,021*** (-5.467)	-264,277*** (-5.398)	-220,315*** (-4.439)	-13,720 (-0.165)	-15,564 (-0.187)
soetag	384,714*** (6.779)		325,097*** (7.156)		-28,915 (-0.348)	
Constant	-1,847,000*** (-6.771)	-1,765,000*** (-6.661)	-1,237,000*** (-3.947)	-1,121,000*** (-3.854)	-1,144,000*** (-3.271)	-1,169,000*** (-3.412)
F Value	138.66	115.87	54.9	48.11	1.12	0.94
Observations	12,253	12,253	5,923	5,923	6,330	6,330
R-squared	0.048	0.053	0.068	0.113	0.001	0.002

Note: Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

This table presents regression results between executive compensation gap and firm ownership attributes. The executive compensation market level is based on all samples as the benchmark; Tobin’s Q as the proxy for investment opportunity and OPR as the proxy for firm’s operating profit performance. The table reports six pooled regressions. Regression 1 (GAPSOER_1) is an OLS regression between EXECOMgap and SOETAG that intends to check whether SOE attribute will increase the executive compensation gap. Regression 2 (GAPSOER_2) further investigates the relation between the compensation gap and SOE attributes, including central SOEs (CENTRALSOE) and local SOEs (LOCALTAG). Regression 3 and 4 (GAPSOER_3 and GAPSOER_4) are conducted among observations in which EXECOM_{gap}>=0. The

purpose of these two regressions is to verify SOE attribute and the executive-compensation gap in companies that executives are underpaid. Regression 5 and 6 (GAPSOER_5 and GAPSOER_6) are conducted among observations in which $EXECOMgap \leq 0$. The purpose of these two regressions is to verify SOE attribute and the executive-compensation gap in companies that executives are overpaid.

Note:

- a) Companyage is Natural log of total years since firm IPO
- b) SHARECON denotes firm's ownership concentration, defined as: (Ownership of the largest shareholder)/(Total ownership)
- c) IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- d) CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm
- e) R-squared value reported in the table is adjusted R².

Table 2.11 Fixed-effects Panel Data Model versus the Dynamic Panel Data Model

VARIABLES	Fixed effects Panel Data	DPD-System GMM
	lnexecom	lnexecom
L.lnexecom		0.548*** (15.06)
exeshare	-0.0693 (-0.718)	-0.723** (-2.103)
grossm	0.658*** (13.24)	1.847*** (6.057)
lnsize	0.511*** (55.09)	0.535*** (13.05)
lever	0.0212*** (6.561)	-0.00620 (-0.312)
ROA	0.0641*** (3.865)	-0.142 (-0.838)
sharecon	-0.0107*** (-15.31)	-0.0133*** (-9.368)
peratio	0.00000413 (0.235)	-0.0000434* (-1.647)
mbratio	-0.000176*** (-3.025)	0.0107 (1.162)
companyage	0.154*** (21.67)	-0.0758*** (-2.715)
idratio	0.537*** (4.575)	-0.0174 (-0.0878)
CEODUAL	0.00968 (0.560)	0.0123 (0.433)
Constant	3.242*** (16.48)	-4.713*** (-7.006)
Arellano-Bond Test (3 order autocorrelation. p-value)		0.6202
Sargan Test (p-value)		0.105
Observations	12,246	11,087
R-squared	0.373	
Number of Companies	2,271	1,947

Note: Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- a) Lnsizes denotes firm size which is natural log of firm's total assets.
- b) PERATIO is ratio of stock price and earning per share, defines as: (Stock price)/(Earnings per share)
- c) MBRATIO is ratio of firm's market value and book value, defined as: (Market value)/(Total assets)
- d) LEVER denotes the debt ratio, namely, debt is divided by firm's total assets

- e) Companyage is Natural log of total years since firm IPO
- f) GROSSM denotes firm's operating margin, defined as: $(\text{Gross profit})/(\text{Operating revenue})$
- g) EXESHARE denotes executives' ownership, calculated as: $(\text{Management ownership})/(\text{Total ownership})$
- h) SHARECON denotes firm's ownership concentration, defined as: $(\text{Ownership of the largest shareholder})/(\text{Total ownership})$
- i) IDRATIO is ratio of firm's independent directors, defined as: $(\text{Num. of independent directors})/(\text{Num. of all directors})$
- j) CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm
- k) L.lnexecom is one year lagged value of dependant variable, lnexecom

This table presents the comparison between fixed-effects panel data model and the dynamic panel data model in determining executive compensation. Estimates in column 1 were obtained using the fixed effects estimator. Estimates in column 2 were obtained using the system GMM estimator. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. The dependent variable is lnexecom, the difference between actual executive compensation level and market determined level. For the system GMM regression, m3 is a test for third-order serial correlation of the differenced residuals, asymptotically distributed as $N(0,1)$ under the null of no serial correlation. The Sargan test of over-identifying restrictions is distributed as Chi-square under the null of instrument validity. We treat lever, lsize, mbratio, ROA, exeshare and grossm as potentially endogenous variables. Levels of these variables dated $t - 1$ and further are used as instruments in the first-differenced equations and first-differences of these same variables lagged twice are used as additional instruments in the level equations.

Table 2.12 Verification between executive compensation Gap (EXECOMGAP) and SOE attribute – Robustness Test (Market-determined level based on full samples, dynamic panel data system GMM model)

	(1)	(2)	(3)	(4)	(5)	(6)
	GAPSOE_1	GAPSOE_2	GAPSOE_3	GAPSOE_4	GAPSOE_5	GAPSOE_6
VARIABLES	Execomgap-all	Execomgap-all	Execomgap>=0	Execomgap>=0	Execomgap<=0	Execomgap<=0
centralsoe		1,334,000*** (4.682)		1,998,000*** (4.687)		-178,329 (-0.796)
localtag		397,606*** (5.443)		306,377*** (2.789)		-24,913 (-0.385)
companyage	299,777*** (6.461)	299,935*** (6.483)	188,986** (2.549)	179,343** (2.417)	446.6 (0.0125)	-157.1 (-0.00444)
sharecon	-20,117*** (-4.596)	-20,516*** (-4.808)	443.9 (0.0595)	-1,496 (-0.214)	-11,571*** (-3.567)	-11,641*** (-3.500)
idratio	2,052,000*** (2.765)	1,849,000** (2.528)	5,061,000*** (4.367)	4,541,000*** (4.001)	-580,449 (-1.099)	-561,174 (-1.072)
CEODUAL	-105,546 (-1.258)	-92,189 (-1.103)	34,128 (0.258)	52,760 (0.397)	29,802 (0.496)	27,402 (0.462)
soetag	502,118*** (7.344)		481,495*** (4.990)		-43,464 (-0.679)	
Constant	488,136 (1.626)	562,676* (1.910)	-4,456 (-0.00941)	237,441 (0.520)	-409,341** (-2.032)	-411,420** (-2.048)
F Value	326.41	288.72	42.74	51.65	52.33	46.46
Observations	12,253	12,253	5,923	5,923	6,330	6,330
R-squared	0.101	0.105	0.018	0.028	0.086	0.086

Note: Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

This table presents regression results between executive compensation gap and firm ownership attributes as a Robustness Test. The executive compensation market level is based on all Chinese listed companies and dynamic panel data system GMM model. The table reports six regressions. Regression 1 (GAPSOED_1) is the regression between EXECOMgap and SOETAG that intends to check whether SOE attribute will increase the executive compensation gap. Regression 2 (GAPSOED_2) further investigates the relation between the compensation gap and SOE attributes, including central SOEs (CENTRALSOE) and local SOEs (LOCALTAG). Regression 3 and 4 (GAPSOED_3 and GAPSOED_4) are conducted among observations in which EXECOM_{gap}>=0. The purpose of these two regressions is to verify SOE attribute and

the executive-compensation gap in companies that executives are underpaid. Regression 5 and 6 (GAPSOED_5 and GAPSOED_6) are conducted among observations in which EXECOMgap \leq 0. The purpose of these two regressions is to verify SOE attribute and the executive-compensation gap in companies that executives are overpaid.

Note:

- a) Companyage is Natural log of total years since firm IPO
- b) SHARECON denotes firm's ownership concentration, defined as: (Ownership of the largest shareholder)/(Total ownership)
- c) IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- d) CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm
- e) R-squared value reported in the table is adjusted R².

Chapter 3: Overinvestment Behavior in Chinese Listed Firms

3.1 Abstract

This chapter studies inefficient investment by Chinese listed firms. The thesis finds that SOE attribute has a significantly positive influence on a firm's unexpected investment. With other conditions controlled, SOEs invest more than non-SOEs; furthermore, SOE attribute is associated with firm's more investments. This study also shows that although local SOEs invest more than other firms, central SOE attribute does not have a significant relationship to a firm's level of unexpected investment.

3.2 Introduction

3.2.1 Background and rationale

The last decade has witnessed a steady, remarkable increase in China's investment rate, from 37.27% in 2001 to 49.93% in 2010⁵. During the same period, the marginal product of capital has undergone a dramatic decrease both relative to previous decades and relative to other countries at similar stages of development (such as Brazil, India, Malaysia, and Thailand). This macroeconomic phenomenon reveals the existence of severe inefficiency associated with firm investment behaviors in China's micro economy.

In theory, investment behaviors are closely connected to corporate governance, which contributes to value creation by using both managerial mechanisms (which influence firm management from the inside) and institutional mechanisms found in the competitive and transactional context (which influence how efficiently firm resources are allocated from the outside) (Shleifer and Vishny, 1997). Since the establishment of the M-M proposition (Modigliani and Miller, 1958), many studies have managed to

⁵ GDP data source: <http://data.eastmoney.com/cjsj/gdp.html>
Investment data source: <http://data.eastmoney.com/cjsj/gdzctz.html>

incorporate investment behaviors with corporate governance into an integrated framework by relaxing the neo-classical assumptions of the M-M theorem to adapt to realistic conditions. The main findings on the causes of investment inefficiencies include agency conflicts, asymmetric information, and psychological bias. Mechanisms for mitigating various investment inefficiencies are also suggested.

That said, the abovementioned findings and suggestions are primarily derived from and consistent with the context of the modern, mature market economy, which features clear property rights, a very free market, abundant information circulation, and efficient rules and regulations. Whereas the case of China's transitional economy features a strong public sector and an imperfect market system, firms' investment behaviors vary widely in many aspects, especially for state-owned enterprises (SOEs). The investment behaviors of Chinese listed companies, which are dominated by SOEs, can be seen as the epitome of China's resource allocation system.

From the perspective of corporate governance, Chinese SOEs are different from the modern corporation both in their internal managerial mechanisms and in their external financing and investment conditions. With respect to SOEs' internal managerial mechanisms, because of the absence of the state owner and the implementation of the compensation regulations discussed in Chapter 2, agency problems and conflicts of interest in Chinese SOEs have become more serious. Thus, SOE managers have an incentive to balance their compensation loss through overinvestment whenever there is enough internal cash flow. Worse yet, the controlling shareholders—from the central government to local governments—have rarely claimed dividends from SOEs, thus increasing the agency problems associated with free cash flow.

With respect to external financing and investment conditions, Chinese SOEs typically enjoy many advantages. First, the government may offer large tax reductions or subsidies to SOEs to reward those firms' investments in national strategic sectors,

which can increase GDP growth or reduce unemployment. Second, Chinese SOEs can obtain favorable bank loans because of financial repression (Shaw, 1973; McKinnon, 1973) and ownership discrimination in credit rationing; this is especially true with respect to loans from the state-owned banks (Allen et al., 2005; Ge and Qiu, 2007; Lu et al., 2009; Brandt and Li, 2010). Third, China's SOEs have substantially greater opportunities than private firms to go public because of China's approval and (since 2004) review system for initial public offerings (IPOs). Moreover, under capital accounts control and imperfect investor protection, the A-shares traded on the Shanghai and Shenzhen Stock Exchanges have a persistent and significant price premium relative to globally traded shares. Accordingly, Chinese firms can raise funds through IPOs and SEOs (seasoned equity offerings) at the cost of public shareholders.

In summary, Chinese listed companies, which are primarily SOEs, continue to experience "investment hunger syndrome" (Kornai, 1986) and enjoy favorable financing conditions, thus giving rise to severe investment inefficiencies, especially for overinvestment problems.

3.2.2 Research purpose

The goal of this chapter is to investigate inefficient investment behavior by Chinese listed companies. This research not only identifies investment behaviors but also measures the degree of any inefficient investments made by listed companies.

Specifically, this chapter does the following:

- It investigates inefficient investments by Chinese listed companies;
- It analyzes the relationship between inefficient investment behavior and company ownership; and
- It analyzes the degree to which listed companies make inefficient investments.

3.2.3 Key findings

In the section, the thesis finds that SOE attribute has a significantly positive influence on a firm's unexpected investment. This result reveals that with other conditions controlled, SOEs make more investments than non-SOEs do; furthermore, SOE attribute is associated with firm's overinvestments. This thesis also finds that local SOEs invest more than other firms; however, central SOE attribute does not have a significant relationship with a firm's unexpected investment level. The study checks the relation between a firm's annual investment and the interaction of cash flow and Tobin's Q (**Cashflow**×**Q**), and empirical study shows a significantly negative relationship between a firm's annual investment and **Cashflow**×**Q** among all listed firms, SOEs and local SOEs. Regression does not find a significant relationship between the two among central SOEs. The results indicate that Chinese listed SOEs generally overinvest. Furthermore, the results also reveal that although local SOEs have overinvestment, central SOEs may not have overinvestment. Furthermore, local SOEs might be the primary factor that causes overinvestment in Chinese listed SOEs.

3.3 Literature review and research context

As early as the 1930s, Fisher (1930) noted that the principle of investment decisions is to select projects with the largest net present value (NPV). Furthermore, the acceptable discount rate to balance a project's revenue flow and cost flow should be no less than the market's interest rate. According to Modigliani and Miller (1958), in a perfect capital market in which the cash raised exactly balances the present value of the liability created, the investment decision rule is as follows: take every positive-NPV project, regardless of whether internal or external funds are used to pay for it.

However, in the event of agency costs, asymmetric information, psychological bias, etc., a firm's management may choose to under- or over-invest, thus decreasing firm

value. This section intends to discuss investment inefficiencies by identifying their causes, determining factors, and the mechanisms of intervention; in addition, it intends to summarize the background of Chinese SOEs' investment behaviors.

3.3.1 The primary causes of investment inefficiencies

According to the huge numbers of papers that have addressed investment inefficiencies, these inefficiencies can be caused (separately or simultaneously) not only by agency conflicts and information asymmetry among the primary stakeholders (shareholders, bondholders, and managers) but also by psychological bias that affects the decision making of top managers.

3.3.1.1 Agency conflicts among the primary stakeholders

In the modern corporation, in which ownership and management rights are separate, the potential conflicts among shareholders, bondholders, and managers influence corporate governance activities and investment policies, which in turn can give rise to inefficient managerial decisions and suboptimal investments that may represent either over- or underinvestment.

1) Conflicts between shareholders and managers

When a firm is defined as a “nexus of contracts” (Jensen and Meckling, 1976), all of the stakeholders regard the firm's activities as part of the nexus of contracts that comprise the firm. Because these explicit and implicit contracts cannot incorporate everything about a firm's investment behaviors, management—especially top management—can abuse its discretionary power to seek private benefits through over- or underinvestment.

Overinvestment problems can take various forms, such as the agency costs of free cash flow, management entrenchment, etc.

The agency costs of free cash flow. According to Jensen (1986), this problem is

defined as managers' use of free cash flow to engage in negative-NPV projects to advance their own interests. Here, free cash flow is the cash in excess of that required to fund all of a firm's positive-NPV projects. Murphy (1985) shows that managerial remuneration has a positive correlation with firm size. Baker (1987) finds that most firms adopt a position-based incentive structure, which encourages managers to create an increasing number of new jobs through business expansion. Jensen (1986) highlights that managers tend to overinvest because of the pecuniary and non-pecuniary benefits associated with a larger firm, and as a result, managers waste the invested funds instead of returning them to shareholders. Therefore, the conflict between shareholders and managers leads to overinvestment.

The agency costs of free cash flow are widely documented in the literature. For example, Jensen (1986) notes that the oil-price increases that began in 1973 have generated large increases of free cash flow in the petroleum industry. Managers did not distribute the excess earnings to shareholders. Instead, the industry continued to spend heavily on exploration and development activities even though average returns were below the cost of capital. Lang, Stulz, and Walkling (1991) show that some tender-offer mergers and acquisitions are driven by the bidder firm's free cash flow. Blanchard et al. (1994) suggest that the managerial behavior after a cash windfall in the form of a won or settled lawsuit is consistent with the agency-conflict hypothesis. Lang et al. (1995) imply that the agency costs of free cash flow increase after asset sales. Harvey et al. (2004) highlight the high probability that firms with a large available cash flow, high levels of assets in place, and limited growth opportunities tend to overinvest. Bates (2005) provides explicit evidence to show that firms that retain the cash from a large asset sale systematically overinvest relative to an industrial benchmark. Fu (2009) shows that, firms after their SEOs tend to invest more heavily than their industrial benchmarks, and that there exists a negative relation between post-issue investment and operating performance, thus providing evidence that overinvestment after SEOs results in a reduction in asset productivity.

Richardson (2006) empirically measures the magnitude of managerial overinvestment. On average, for every dollar of additional free cash flow, the firm tends to overinvest \$0.44, keep \$0.40 in its financial assets, and distribute only \$0.22 to the shareholders.

Management entrenchment. Shleifer and Vishny (1989) argue that managers can entrench themselves by making manager-specific investments that make it costly for shareholders to replace them. By making manager-specific investments, managers can reduce the probability of being replaced, extract higher wages and larger perquisites from shareholders, and obtain broader latitude in determining corporate strategy, including investment decisions.

According to Hirshleifer (1993) and Thakor (1993), there are other ways in which managers can manipulate investment decisions both to improve their reputations and to provide other private benefits.

First, **visibility bias** is defined as improving what is immediately visible at the cost of what is not immediately visible. This action leads to an overinvestment process because managers can undertake investment projects with negative NPVs that apparently offer good results, thus increasing their reputation.

Second, **resolution preference** refers to actions taken by managers to advance the arrival of news that is likely to be good and to delay the arrival of news that is likely to be bad, which gives rise to an overinvestment problem when managers try to increase the nearest cash flow at the cost of the more distant ones, changing projects' NPV from positive to negative.

Third, **herding behavior** (see more details in 3.3.1.3) means that managers in a given industry may all make similar choices. If investors expect a high-quality firm to undertake ambitious investments, firms with low-quality investment opportunities may overinvest so that they appear to be firms with high-quality investments. Firms

with high-quality investments also invest too much so that they avoid being identified with lower-quality firms. Consequently, many negative-NPV projects are carried out because there is a strong trend for managers to overinvest.

Fourth, **risk avoidance** or **excessive conservatism** is defined as opting for projects that are safer-than-optimal for shareholders. If a manager dislikes personal risk, he can defer the resolution of uncertainty, which makes his lifetime income more certain than if his reputation and pay were to sharply increase or decrease with an immediate news event.

Finally, **over shoes over boots** means that managers delay divesting money-losing projects to avoid conceding that failure has already occurred.

It must be noted that the list above is more illustrative than exhaustive. However, Aggarwal and Samwick (2006) challenge the overinvestment hypothesis by proposing that managers may be either empire-builders or shirkers. As empire-builders, they pursue private benefits through overinvestment, whereas as shirkers, they choose underinvestment to mitigate the cost of overseeing new projects. Moreover, those authors provide evidence that is inconsistent with the hypothesis of overinvestment but is consistent with models of underinvestment.

2) Conflicts between insiders and creditors

Here, “insiders” include both shareholders and management. Debt financing generates a set of responsibilities and incentives in business management that can cause conflicts of interest between insiders and creditors. These conflicts, together with information asymmetries and incomplete contracting, can cause suboptimal investment. For the sake of the shareholders, management may undertake investments that maximize the firm’s equity value instead of its entire value.

Fama and Miller (1972) note that an investment decision that maximizes shareholders’

wealth does not necessarily maximize creditors' wealth. The authors attribute this phenomenon to shareholders and creditors' different preferences for income uncertainties. Generally, creditors prefer less uncertainty in project earnings than shareholders do. If a firm chooses projects with less uncertainty in their earnings, its overall risk is low because its debt value is high but its equity value is low; for projects with more uncertainties, the inverse is true.

Jensen and Meckling (1976) note that insiders are motivated to undertake investment projects with higher returns but less opportunity to succeed. If these projects do succeed, the insiders take the gains; if they fail, the losses are shared among the insiders and creditors. When a firm's leverage exceeds a certain limit, the insiders are much more likely to carry out highly risky projects that increase equity value and decrease debt value, thus transferring wealth from debt-holders to shareholders. The inclination for insiders to substitute low-risk projects for high-risk ones is named "risk shifting" or "asset substitution".

In contrast, Myers (1977) notes that the issuance of risky bonds will lead to underinvestment. When the expected returns of a particular investment do not exceed a firm's debt, creditors will take all of the benefit and shareholders will get nothing. This means that some projects with positive but inadequate NPVs will be rejected by management, who acts on behalf of the shareholders.

Parrino and Weisbach (1999), using numerical techniques, compute the expected wealth transfer between stockholders and bondholders when a firm adopts a new project. They confirm the existence of shareholder-creditor conflicts and show that the maturity structure of debt, the magnitude of cash flow, firm size, and industrial characteristics are all factors that influence asset substitution and underinvestment.

More specifically, the problems of asset substitution and underinvestment also arise out of the problem of asymmetric information, which will be discussed in section

3.3.1.2.

3) Conflicts between controlling and minority shareholders

In many countries, corporations are run by controlling shareholders whose cash flow rights are substantially smaller than their control rights (La Porta et al., 1999). For example, controlling shareholders may acquire complete control over cash flow rights with significantly less than 50% ownership via dual-class shares, pyramid-ownership structures or cross-ownership (Bebchuk et al., 1999). This separation of ownership and control allows self-interested controlling shareholders to extract private benefits from outside minority shareholders (Berle and Means, 1932; Jensen and Meckling, 1976). Dyck and Zingales (2004), among other scholars, report large private benefits of control based on empirical observation that supports this conclusion.

In theory, controlling shareholders may pursue private benefits through either tunneling or overinvestment. Holmén and Högfeldt (2005) observe that in an economy in which pyramid-ownership structures are transparent and the tax system regulates the flow of dividends within the pyramid and to shareholders, the primary cause of large evaluation discounts on both the pyramid holding company and the portfolio firms at the bottom is overinvestment, not tunneling. In addition, Albuquerque and Wang (2007) establish that in a situation of imperfect investor protection, controlling shareholders have incentives to overinvest, leading to higher return volatility, lower Tobin's Q, a larger risk premium, and a higher interest rate.

3.3.1.2 Information asymmetry between insiders and outsiders

Here, “insiders” refers to incumbent shareholders and managers, and “outsiders” refers to bondholders or prospective shareholders. The literature on information asymmetry between insiders and outsiders usually proposes that management acts on

behalf of the incumbent shareholders, thus neglecting the abovementioned agency problems between incumbent shareholders and management.

Information asymmetry can be categorized into two classes: ex ante and ex post. Ex ante (pre-contract) information asymmetry between shareholders and bondholders result in an adverse selection problem. Stiglitz and Weiss (1981) note that because increasing interest rates or increasing collateral requirements could attract undesirable investors and discourage safer investors; neither instrument will necessarily be used to equate the supply of loanable funds with the demand for same when there is pre-contractual asymmetric information between creditors and observationally identical borrowers. Accordingly, credit restrictions take the form of limiting the number of loans, i.e., some borrowers receive loans and others do not. Under those circumstances, some projects with positive NPVs will not be financed.

In the previous scenario, shareholders have another alternative: issuing new shares. In this case, however, adverse selection also facilitates the conflict between incumbent and prospective shareholders. Myers and Majluf (1984) note that underinvestment may occur when firms have information that its investors do not have. According to their model, a firm must issue common stock to raise cash and undertake a valuable investment opportunity; the management knows more than the potential investors about the firm's value, and because the potential investors are aware of this, they decrease their bids for the new shares. On behalf of the current shareholders, the management may pass up investment opportunities when their positive NPVs do not balance dilution-related losses.

According to the pecking order theory of corporate financing (Myers and Majluf, 1984), in the case of asymmetric information, internal and external financing have different capital costs. Therefore, companies in need of funds will prefer internal financing, which has the lowest cost; if external financing is needed, companies will prefer obtaining less risky debt financing over issuing equity. In brief, the optimal

pecking order of corporate financing is as follows: internal financing, debt financing, and equity issuance.

That said, Narayanan (1988) modifies the Myers-Majluf model (1984) by assuming that managers' private information is more likely to concern the value of new investment opportunities, not the value of existing assets. In this case, the managers will choose to issue shares only if the new project's NPV exceeds a certain threshold level. Narayan further proves that this threshold level is less than zero, namely, the company will invest in projects with negative NPV. Furthermore, Narayanan (1988) has obtained a conclusion opposite that of the Myers-Majluf model (1984). Moreover, Daniel and Titman (1995) argue that Myers and Majluf (1984) ignore the possibility of positive responses by the current shareholders in the event of devaluation of the newly issuing shares. If the current shareholders are willing to purchase a certain percentage of new shares, the market discounts associated with adverse selection can be effectively eliminated, and the underinvestment problem can be overcome.

Ex post (post-contract) information asymmetry between shareholders and bondholders gives rise to a moral hazard problem. According to the literature, moral hazard includes both overinvestment and underinvestment. On the one hand, the risk shifting or asset substitution problem highlighted by Jensen and Meckling (1976) is the sequence of moral hazard conducted by self-interested insiders. On the other hand, Myers (1977) notes that shareholders might pass up positive-NPV projects whenever the profits will be primarily used to pay off existing bondholders, thus resulting in underinvestment.

In addition, moral hazard, together with the problem of incomplete contracting, makes it crucial to allocate the residual control and claim rights associated with investment assets, which affects ex ante investment decisions (Hart, 1995). Because investment assets are usually specific (Williamson, 1985), under the proposition of limited rationality and opportunism, the "holdup" problem will occur and investors cannot

obtain all of the marginal revenue of their investment, which inevitably leads to underinvestment.

3.3.1.3 The psychological bias of top managers

From the behavioral-finance perspective, perception bias can influence managers' decision-making. "Mental errors" such as *overconfidence*, *biased self-attribution*, *survival bias*, *representative bias*, *conservative bias*, and *herding behavior* can lead to overinvestment.

Keynes (1936) has already noted that investment behaviors are driven by the "animal spirits" of entrepreneurs. As a group, top managers—especially CEOs—particularly enjoy the spotlight and applause, and they possess a high level of self-confidence. In addition, as Warren Buffett observes, many CEOs attain their positions partly because they possess an abundance of "animal spirits". If an executive is heavily endowed with those qualities, reaching the top will not make them disappear. When such a CEO is encouraged by his advisors to make acquisition deals, he is more likely to engage in overinvestment.

Behavioral studies have found that *overconfidence* is one of the most entrenched features of human psychology (DeBondt and Thaler, 1994). Managers, while acting with the goal of maximizing value for shareholders, can nevertheless either overestimate their own competencies or be overly optimistic about the firm's potential profitability by investing in projects that do not really have a positive NPV (Stein, 2003). In the case of takeovers or mergers, overconfident CEOs overestimate their ability to generate returns. Consequently, they overpay for target companies and undertake value-destroying takeovers or mergers (Roll, 1986; Malmendier and Tate, 2008). As observed by Kaplan (1989), the many buyouts and mergers that occurred during the 1980s and did not increase value for shareholders were often the result of

this type of overinvestment. Malmendier and Tate (2009) argue that overconfident managers both overestimate the returns on their investment projects and view external funds as unduly costly. Accordingly, they overinvest when they have abundant internal funds but curtail investment when they need external financing. Galasso and Simcoe (2011) highlight that overconfident CEOs, who underestimate the probability of failure, are more likely to pursue a new technological innovation; moreover, this effect is stronger in industries that are more competitive.

Daniel, Hirshleifer, and Subrahmanyam (1998) attribute overconfidence to “biased self-attribution”—one is prone to attribute success to his abilities and attribute failure to bad luck. Moreover, “survival bias” can strengthen winners’ overconfidence, given that top managers are thought of as winners who have survived the jungle of furious competition. Thus, top managers should be much more overconfident than ordinary people.

Barberis et al. (1998) mentions two types of perception bias with regard to external changes, namely, *representative bias* and *conservative bias*. A person with *representative bias* focuses too closely on recent changes and regards them as representing future trends; therefore, such a person overreacts to recent changes. A person with *conservative bias* pays more attention to the average state over a long period and regards recent changes as temporary; therefore, such a person underreacts to recent changes. It can be inferred that managers with a *representative bias* can overinvest in response to recent, favorable changes and that managers with a *conservative bias* can overinvest in response to recent, unfavorable changes.

Herding behaviors refer to the phenomenon that without perfect information, a person chooses to follow others' behavior and neglects his own private information. Herding behaviors often give birth to boom-bust cycles. The cause of herding behavior may be either rational or irrational. Banerjee (1992) and Bikhchandani et al. (1992) argue that when investors believe themselves to be less informed than others, it is rational for

them to mimic others' behavior. Bikhchandani et al. (1998) notes that to maintain their prestige, managers may also rationally choose to mimic their peers' investment behaviors. However, there are many irrational followers who make their investment decisions based on sentiment, intuition, or rumors (Shleifer and Summers 1990).

In addition, the stock market is affected by investors' psychological bias. Stock prices have a stronger impact on investments by firms that need external equity to finance their marginal investments (Baker, Stein and Wurgler, 2002). Hua, Liu, and Xu (2010) discover a strong, positive correlation between market sentiment and overinvestment by public companies. Furthermore, market sentiments may either magnify overinvestment, which reduces efficiency, or modify underinvestment, which improves efficiency; in the aggregate, the former effect exceeds the latter.

3.3.2 Determining factors related to investment inefficiency

Although investment inefficiency can occur for various reasons, the magnitude is not monotonic among firms with different characteristics. According to the literature, the primary determining factors of over- and underinvestment include the availability of free cash flow, possibility for growth, and debt level.

3.3.2.1 The effect of financial conditions and growth prospects

In general, the possibility of using free cash flow allows managers to choose inefficient investment projects with negative NPVs. However, when considering a firm's growth prospects, the management with access to free cash flow does not always choose to overinvest. The figure 3.1 below summarizes the relationship between growth prospects, financial conditions, and investment choices.

[Figure 3.1]

On the one hand, when a firm is under positive financial conditions, i.e., the firm has

a large amount of free cash flow, the presence of enough investment opportunities could prevent management from overinvesting, as an optimal investment policy will be the best choice for both shareholders and the management. However, the presence of sufficient free cash flow and the absence of good investment opportunities could stimulate management to either squander cash on organizational inefficiencies instead of returning it to the shareholders or waste it on investments that do not cover the cost of the capital.

On the other hand, a firm under negative financial conditions that nonetheless enjoys good growth opportunities will choose a risk-avoidance policy, i.e., management will take precautions to protect its control over the firm and prevent others from taking advantage of the future benefits of the firm's growth opportunities. Accordingly, a risk-avoidance policy can give rise to underinvestment. Conversely, for a firm experiencing a situation of risky debt and poor opportunities for growth, the incentives for risk shifting and underinvestment become dominant because, ultimately, the firm might not be able to obtain the value created by the investments (in that the value would benefit only the debtholders). Otherwise, the firm would make investments with both high return expectations and much more volatility than presented by the average risk level of the firm's activities.

Additionally, Bernankel and Gertler (1989) note that a firm's NPV level is not constant; instead, it varies with economic cycles. Accordingly, in a period of economic expansion, the firm's NPV increases and it could have less need for external financing, thus mitigating the agency costs of external financing and encouraging more investment; in a period of economic recession, the situation is exactly the inverse.

In brief, a firm's investment policy is highly dependent on its growth opportunities and financial conditions. The initial empirical analysis of these problems can be found in Fazzari, Hubbard, and Petersen (1988) (FHP), in which higher investment

sensitivity to cash flow availability is found in companies with lower dividend payment ratios, which they interpret as evidence of financing constraints. That study has stimulated theoretical and empirical literature on the relationship between investments, cash flow availability, value, and leverage. For example, Chapman et al. (1996), using sample data from 58 Australian companies from 1974 to 1990, arrive at the same conclusion as FHP (1988). However, Kaplan and Zingales (1997), Cleary (1999), Gomes (2001), and others challenge FHP's conclusion by arguing not only that a statistically significant coefficient of correlation between investment and cash flow is a condition that is neither necessary nor sufficient for the existence of financing constraints but also that there is no reason to use regression coefficients to measure the degree of financing constraints. According to Kaplan and Zingales (1997), investment sensitivity to cash flow availability should instead be attributed to the agency costs of free cash flow proposed by Jensen (1986).

Some recent researches also spot light on investment-cash flow relations. Firth et al. (2012) report a U-shaped investment-cash flow relation in China's listed companies. Such relation indicates that investment increases as internal funds increase when internal funds are high, but decrease as internal funds increase when internal funds are sufficiently low. Ding et al. (2013) use a panel of over 120,000 Chinese firms owned by different agents over the period 2000-2007 to analyse the linkages between investment in fixed and working capital and financing constraints. The authors report that those firms characterized by high working capital display high sensitivities of investment in working capital to cash flow (WKS), and low sensitivities of investment in fixed capital to cash flow (FKS). Furthermore, the authors argue that good working capital management may help firms to alleviate the effects of financing constraints on investment because despite severe external financing constraints, those firms with low FKS and high WKS exhibit the highest investment rates. Using a large panel of Chinese listed firms over the period 1998 - 2014, Guariglia and Yang (2016) document strong evidence of investment inefficiency caused by a combination of financing constraints and agency problems. The authors argue that firms with cash

flow below (above) their optimal level tend to under- (over-) invest as a consequence of financing constraints (agency costs).

Additionally, Pinegar and Wilbricht (1989) find that flexibility is the most important factor that affects financing decisions. A survey by Graham and Harvey (2001) supports Pinegar and Wilbricht's (1989) findings. Graham and Harvey (2001) document how American CFOs manage to maintain financial elasticity to protect their ability to take advantage of growth opportunities. One reason for firms to remain flexible is the need to minimize interest obligations so they do not need to shrink their businesses in the event of an economic downturn. Financial elasticity thus has value because a shortage of it can both damage firm value and block future optimal investment policies. Bo et al. (2014) argue that financial crisis also impact firm's investment behaviour. The authors examine how Chinese corporate investment responds to the financial crisis in 2008 and document that the overall impact of the financial crisis on Chinese corporate investment is negative and demand channel dominates the real effect of financial crisis to Chinese listed firms. They also highlight that financial assets held by a nonfinancial firm are important in the firm's fixed investment equation in Chinese listed firms. Chen and Guariglia (2013) discussed the linkage between finance and firm-level productivity and report that, especially for illiquid firms, productivity is strongly constrained by the availability of internal finance. Furthermore, the authors find higher sensitivities of productivity to cash flow for private exporters, but lower sensitivities for foreign exporters.

Guariglia and Liu (2014) also studied the relation between firm's innovation investment and financing constraints in Chinese unlisted firms. Based on a variety of specifications and estimation methods the authors document that Chinese firms' innovation activities are constrained by the availability of internal finance. Specifically, private firms suffer them most, followed by foreign firms, while state-owned and collective enterprises are the least constrained.

3.3.2.2 The effect of debt under different conditions

Generally speaking, debt has two different effects on investment behaviors. On the one hand, it can create shareholder-creditor conflicts that result in asset substitution and underinvestment, and therefore, it is negatively correlated to growth opportunities (Myers, 1977). On the other hand, it can reduce management-controlled cash through fixed principal and interest payments, thus mitigating the agency costs of free cash flow, and therefore, it is positively connected to assets in place (Jensen, 1986). Accordingly, “firms should use relatively more debt to finance assets in place and relatively more equity to finance growth opportunities” (Hovakimian et al., 2001).

Stultz (1990) shows that firms with poor investment opportunities are predisposed to incur higher debt levels so that management will control fewer resources, whereas firms with good investment opportunities exhibit more moderate debt levels. This phenomenon implies the existence of a negative relationship between growth opportunities and firm leverage. Among the many empirical studies conducted to examine this type of relationship, Smith and Watts (1992) investigate empirical relations at the industry level among financing policy, dividend policy, compensation policy, and the investment opportunity set, and their results confirm Stultz’s (1990) theory by not distinguishing between firms with high and low growth rates. Instead, McConnell and Servaes (1995) and Lang et al. (1996) obtain valuable results by dividing their analysis samples into two subgroups: high-growth firms (with a high Tobin’s Q) and low-growth firms (with a low Tobin’s Q). McConnell and Servaes (1995) observe a negative correlation between corporate value and leverage for ‘high-growth’ firms, and a positive one for ‘low-growth’ firms. Lang et al. (1996) do not witness any relationship between the two variables for the subgroup of ‘high-growth’ firms, whereas they observe a strong negative correlation between corporate value and leverage for ‘low-growth’ firms. Therefore, they confirm Jensen’s (1986) hypothesis that debt can enhance control of overinvestment. Furthermore, firms with high growth rates show low levels of leverage (Bradley et al, 1984; Titman

and Wessel, 1988; Smith and Watts, 1992) and prefer short-term debt to long-term debt (Barclay and Smith, 1995).

3.3.3 Mechanisms for mitigating investment inefficiency

The financial literature has suggested several mechanisms for mitigating the over- or underinvestment problems discussed in the previous section (Myers, 1977; Smith and Warner, 1979; Green, 1984; Diamond, 1989; Berkovitch and Kim, 1990; etc.). As set forth in Figure 3.2, this section provides a detailed illustration of each mechanism that corresponds to the various causes of investment inefficiency.

[Figure 3.2]

3.3.3.1 Mechanisms to mitigate shareholder-manager conflicts

The literature has presented two types of mechanisms for mitigating overinvestment derived from shareholder-manager conflicts. One method is to reduce management-controlled cash flow (e.g., debt overhang, dividend payout, share repurchase), and the other is to align shareholder and manager interests through an incentive-based compensation policy (e.g., annual bonus, stock grants, stock-option grants).

Debt overhang. Debt mitigates shareholder-manager conflicts in two ways. On the one hand, it reduces the disposable cash flow available for managers because of the need to return the principal and interest; on the other hand, it subjects managers to increased monitoring and an increased risk of bankruptcy—once the firm cannot repay the debt, creditors will take control, and the managers will lose all of their interests in the firm.

As noted by Jensen (1986), placing limits on managerial decision-making power can be particularly effective when managing shareholder-manager conflicts that arise out

of the issue of how to allocate free cash flow. Moreover, a high level of recourse to debt capital represents a positive sign for the capital market, which results in share appreciation (Ross, 1977).

Additionally, the introduction of debt as a means of corporate governance has positive effects on alleviating the insider control problem, which arises with the free-rider problem in the case of public companies with an atomic ownership structure (Grossman and Hart, 1986).

That said Zweibel (1996) notes that managers do not voluntarily accept the type of “discipline” represented by debt. De Jong (2001) shows that in Holland, managers attempt to avoid using debt to prevent limitations on their decision-making power. Williamson (1996) argues that when debt and equity are considered as substitutable means of governance instead of as financing instruments, the choice between debt and equity depends on the specificity of investment assets. If investment assets are less specific, debt should be chosen because the firm’s assets retain some value even in the event of default. Conversely, if investment assets are highly specific, it is better to fund investment with equity. In the latter case, unfortunately, the mechanism’s efficiency depends on the level of manager entrenchment (Berger, et al., 1997).

Dividend payments. There are two ways in which dividend payments can help alleviate agency problems between shareholders and managers. On the one hand, Jensen (1986) argues that dividend payments prevent managers from undertaking negative-NPV projects because they have to disgorge the firm’s free cash flow. On the other hand, Rozeff (1982) and Easterbrook (1984) highlight that dividend payments increase the probability of a firm’s need to issue new securities, which facilitates the scrutiny of potential investors and aligns the interests of shareholders and managers. In both cases, dividend payments provide a weaker mechanism than debt payments do for limiting the cash available to managers because dividend payments are not subject to the same legal obligation as debt payments (Byrd, et al.,

1998).

Share repurchase. This is an additional method to limit managers' control over free cash flow. This method should be used only when a listed company is undervalued by the market and its opportunity cost is limited, i.e., when the company does not have better investment opportunities for its free cash flow on hand.

Remuneration policy. This mechanism differs from the others mentioned above in that it is an incentive, not a restriction. A remuneration package consists of fixed salary and unfixed compensation. The common scheme includes an annual bonus, stock grants, stock options, and other incentives (e.g., perks, tax reimbursements, and pensions). The effectiveness of unfixed compensation depends on investment opportunities. Gaver and Gaver (1993) find that growth firms are significantly more likely than non-growth firms to have stock option plans. In a later study, Gaver and Gaver (1995) analyze the proportions of executive compensation derived from salary, bonus, long-term incentive compensation, and stock-based compensation. They find that executives at growth firms receive a larger portion of their compensation from long-term incentive compensation, whereas executives at non-growth firms receive a larger portion of their pay from a fixed salary, which implies that long-term incentive contracts reduce the agency costs associated with shareholder-manager information asymmetries in growth firms.

According to Jensen (1994), remuneration policies must be closely linked to firms' market value. In addition, he stresses that stock and stock options can help align the interests of managers and shareholders because both mechanisms can reward managers sufficiently whenever they maximize shareholder wealth. However, there is an important difference between stock and stock options in that stock punishes managers whenever shareholder wealth decreases, whereas managers can relinquish their stock options to avoid losses. For this reason, Sanders (1999) suggests that the right compensation mechanism for a low-risk firm should be stock; otherwise, it

should be stock options.

3.3.3.2 Mechanisms to mitigate risk shifting

Risk shifting usually occurs with the introduction of debt and can be alleviated by convertible bonds and separate incorporation.

Convertible bonds. As a special kind of financing instrument, convertible bonds offer the possibility of converting debt capital into equity. Many studies (Jensen and Meckling, 1976; Smith and Warner, 1979; Harris and Raviv, 1985; Stein, 1992; Nachman and Noe, 1994; Cornelli and Yosha, 2003) have emphasized the usefulness of convertible bonds in containing incentives for risk shifting. As formulated by Black and Scholes (1973), investments with growing risk would increase the conversion option value of convertible bonds and therefore decrease risk shifting from shareholders to bondholders. Green (1984) shows that under certain conditions, the use of conversion features and warrants can help restore net present value, thus maximizing incentives and simultaneously fulfilling the firm's financing requirements. On the one hand, callable, convertible bonds help control the overinvestment incentives that can arise if financing is provided prior to an investment option's maturity, as their conversion options provide sequential financing at a relatively lower cost (Mayers, 1996). On the other hand, because convertible debt can adjust firms' debt levels through its convertibility, it is superior to common debt and equity in controlling managerial opportunism, including both over- and underinvestment (Isagawa, 2000).

In reality, convertible bonds can be used under several conditions. Mikkelsen (1981) observes that firms with substantial debt and good growth opportunities issue a larger quantity of convertible debt to obtain the financial resources needed for new investments. Stein (1992) argues that corporations may use convertible bonds as an

indirect way to incorporate equity into their capital structures when the direct issuance of debt could lead to financial distress and when adverse selection problems make a conventional stock issue unattractive. Essig (1991) shows that the probability of firms issuing convertible bonds is positively correlated to the R&D costs-to-sales ratio, the market-to-book ratio, the long-term debt-to-equity ratio, and cash flow volatility, whereas it is negatively correlated to the tangible assets ratio. Repullo and Suarez (1998) note that venture capital activities make particularly broad use of convertible bonds precisely because they protect firm activity from opportunistic behaviors.

Separate incorporation. When debt funding projects are organized, it becomes difficult for shareholders to undertake more risky investment projects than those initially proposed to creditors. Accordingly, the problems of symmetric information and high capital costs can be alleviated to some extent. Based on the same rationale, when the market's perceived risks of new projects are high and risk shifting problems dominate, one alternative is to issue new debt that is subordinated to old debt.

3.3.3.3 Mechanisms to mitigate overinvestment in cases of pyramid ownership

To mitigate conflicts between controlling and minority shareholders, investor protection is of first-order importance. As Zingales (2004) note, all other mechanisms become totally inefficient when conflicts of interest are based on “abuses carried out by those who are willing to falsify documents, to lie and to deceive, out of desperation or of a lack of scruples”, as in the notorious Enron and WorldCom cases. La Porta et al. (2002), Claessens et al. (2002), Doidge et al. (2004), and Gompers et al. (2003), among others, have documented how imperfect investor protection lowers firm value. For example, La Porta et al. (2000) find that corporate payouts are lower in countries with weaker investor protection, where the agency costs of free cash flow are more severe. Harvey (1995) shows that emerging markets display higher return volatility

and larger equity risk premia because on average, emerging market economies have weaker corporate governance.

La Porta et al. (2002), Gompers et al. (2003), and Doidge et al. (2004) find that firm value increases with investor protection. Hail and Leuz (2006) establish a positive link between excess returns and various investor protection variables using cross-national evidence. Albuquerque and Wang (2008) show that strengthening investor protection has a significant wealth-redistribution effect from controlling to outside shareholders. Outside shareholders in Korea are willing to give up 11.2% of their capital stock holdings, or \$4.7 billion of current wealth, in exchange for an environment with perfect investor protection. In the US, outside shareholders are willing to give up 0.38% of their capital stock holdings, or \$43 billion of current their wealth, for the same result.

In theory, relevant regulations and acts should be passed to improve investor protection, as the US Congress did with the Sarbanes-Oxley Act of 2002. However, the political process to improve investor protection is naturally difficult because the political power required to control shareholders and incumbent entrepreneurs is much stronger than that required to control outside investors and future entrepreneurs (Albuquerque and Wang, 2008).

3.3.3.4 Mechanisms to mitigate information asymmetry

To reduce the adverse selection and moral hazard problems derived from information asymmetry, increased financial market efficiency is an immediate action, whereas concentration of debtholders and the reputation mechanism are also effective.

Increase in financial market efficiency. In theory, rapid, transparent circulation of information in the financial system would reduce the adverse selection and moral

hazard problems because opportunistic behaviors would be forbidden. Incentives to generate and disseminate information are crucial features of a financial system (Allen and Gale 2001). Therefore, it is suggested that relevant regulations be approved to increase capital market efficiency. For instance, the Italian “Consolidated Act on Financial Intermediation” (Legislative Decree n.58/1998) reforms the law on financial services, stock exchanges, and listed companies to reduce the incentives for suboptimal investment (Enriques, 2008).

Concentration of debt holders. As the number of creditors decreases, free-rider problems are reduced, and major creditors have an incentive to focus on the firm's managerial activity. Moreover, as direct relations are established between managers and creditors in the event of insolvency, it is easier to renegotiate with fewer creditors than with a large number of creditors, as each have different rights and demands (Bolton and Scharfstein, 1996).

Examples of concentrated debt include bank debts and private placements through institutional investors. In the case of bank debts, it is particularly helpful to mitigate potential distortions in the process of investment project selection because banks are good at monitoring a firm's investment decisions. However, bank financing has high intermediary costs and creates hold-up problems. Therefore, the firm must make a tradeoff between the cost of asymmetric information and hold-up. According to Bolton and Scharfstein (1996), firms at a low risk of default, firms with strong asset complementarities, and firms in non-cyclical businesses will tend to borrow from more creditors because the problems of asymmetric information are not as severe as firms at a high risk of default.

Reputation building. According to Kreps and Wilson (1982) and Milgrom and Roberts (1982), a reputation can be viewed as arising from learning over time from observed behavior about some exogenous characteristics of agents. Despite all of the problems (e.g., visibility bias, resolution preference, herding behavior, risk avoidance)

related to reputation-seeking by managers, from an evolutionary perspective, “honesty is the best policy” (Myers, 1977). As demonstrated by Diamond (1989), if there is little adverse selection, then the reputation mechanism will work from the beginning; conversely, if there is sufficient adverse selection, then a typical equilibrium path for a borrower is to choose projects with both high risk and high maximum return when “young”, and if it can survive long enough without a default, to switch to safe projects from that point forward. In the long term, reputation is important because it becomes a valuable asset worthy of protection.

3.3.3.5 Mechanisms to mitigate overinvestment related to overconfidence

As noted earlier, overconfidence is one of the most persistent behavioral biases, and thus, it is almost impossible to eliminate from an individual’s mindset. However, the literature (Malmendier and Tate, 2005) indicates that overconfidence is an observable characteristic (at least somewhat), and thus, a firm can distinguish between overconfident and realistic CEOs and make trade-offs. Furthermore, market competition has an impact on the level of prevalent CEO overconfidence and overinvestment.

Intensive market competition. Englmaier (2010) and Englmaier (2011) show that in the R&D tournament, a firm tends to hire an overconfident CEO to obtain a competitive edge over its competitors. Accordingly, the prevailing CEO overconfidence results in an equilibrium outcome. Yu (2014) shows an inverted U-shaped relation between the prevailing CEO overconfidence level and the intensity of market competition. Additionally, the CEO overconfidence level converges to a realistic level when there are infinitely many firms in the market. This result suggests that firms in an oligopoly hire CEOs with greater overconfidence than firms in a duopoly. If the market is perfectly competitive, the benefits of this practice vanish and firms will hire realistic CEOs. In addition, it is shown that firm profit and R&D both

exhibit an inverted U-shaped relation with the intensity of market competition, which is consistent with the finding of Aghion et al. (2005).

3.3.4 Investment behaviors of Chinese SOEs

When studying corporate finance in a transitional economy, one must have a good understanding of fundamentals such as the economy's culture, history, and political and legal systems (Williamson, 2000; Claessens, et al., 2002). Accordingly, this section presents a glimpse of these fundamental factors within which the investment behaviors of Chinese SOEs are created.

3.3.4.1 Chinese SOE reform over the past three decades

China's transition from a planned to a market economy began in the late 1970s. In approximately 1980, although the public sector accounted for 95.3 percent of China's total industrial and agricultural output, SOEs had little operational autonomy. Under the planned economic system, SOEs received all inputs from the state according to central plans; they delivered all of their outputs and transferred all of their revenues to the state. Simultaneously, all of an SOE's funds were borrowed and repaid by the state, and all of its staff (including both managers and workers) were state-appointed and state-assigned. Moreover, to change China's condition of being "poor and blank", a "catchup" strategy was pursued, and developing heavy industries was prioritized. Accordingly, rates of interest, foreign exchange, and wages, along with the prices of energy, raw materials, and living necessities, were artificially suppressed by the state. This disadvantageous development strategy, together with the planned economic problems, induced both overinvestment in capital-intensive heavy industries and underinvestment in labor-intensive industries. Consequently, SOEs presented investment inefficiency. From 1957, when the "First Five-Year Plan" was completed, to 1978, when China was on the eve of reform and opening up, SOE investment increased by 6.7 times, whereas the GDP created by SOEs increased by only 3.9

times.

With the market-oriented reforms implemented since the late 1970s, most of the prices of products and productive factors were gradually liberalized. Conversely, non-state domestic and foreign firms were given access to an increasing number of industries. In general, non-state firms are more competitive than SOEs in terms of their product lines, corporate governance, and operational costs, which render explicit the underperformance of SOEs. Since the beginning of the reform, the Chinese government has focused on improving SOE performance. SOE reform over the past three decades can be roughly divided into three stages.

1) Enlargement of operational autonomy and interests (1978-1992)

At the beginning stage of the reform, the Chinese government attributed SOE inefficiency to the lack of operational autonomy and material incentives. The third plenary session of the CPC's 11th Central Committee, which was held in December 1978, noted that one of the most serious drawbacks of China's traditional economic system is excessively centralized power, and thus, the direction of reform should be to entrust local governments and enterprises with much more operational autonomy. In 1979, the government granted 14 economic rights to SOEs, including production autonomy, the right to purchase raw materials, the right to sell products, and the right to employ workers. Later, incentive measures such as profit retention, replacing profit with taxation, and contracts for production and management were implemented. Unfortunately, the effects of these measures were limited⁶, and the number of SOEs experiencing losses had been increasing since the reform. By the end of 1990, the statistical proportion of loss-making SOEs had reached more than 30%; in reality, this indicator should be much higher following the deduction of government subsidies.

⁶ According to China's National Bureau of Statistics, 1991, number of SOEs experiencing losses increased from 4185 in 1985 to 11898 in 1990, the proportion of SOEs experiencing losses was 10.69% in 1985 increased to 31.5% in 1990. Meanwhile, the total losses (value in million RMB) increased from 2678 million in 1985 to 28603 million in 1990.

The causes of these SOE losses are complicated. First, conflicts of interest between the state (the owner) and insiders (managers and workers) became explicit and sometimes quite sharp after SOEs were given broad operational autonomy. The state was concerned about its fiscal revenues, whereas the insiders were concerned about their private interests. When SOEs profited, the insiders managed to retain a portion for themselves; when SOEs incurred losses, the insiders asked the government for subsidies. Second, severely asymmetric information between the state and insiders in a transitional economy made it difficult to implement operational contracts. The state did not have a clear understanding of each SOE's costs and revenues, whereas the insiders could not precisely forecast the next step of the reform, such as which products were likely to have their prices liberalized or whether the current reforms would last for a long time. Third, policy burdens made SOEs less competitive than non-state firms (Lin, 1999). On the one hand, SOEs carried the strategic burdens of developing heavy industries in a capital-scarce economy; on the other hand, SOEs carried the social burdens of overstaffing, large retirement pensions, medical care, education, and other types of social welfare.

2) Institutional innovations and structural adjustments (1993-2002)

During this stage, the goal of China's reform was defined, and the focus of SOE reform turned to institutional innovations and structural adjustments. Based on the reform philosophies of Deng Xiaoping's "Talks during Excursions to China's Southern Cities" in 1992, the Chinese Communist Party approved the "Decision of the CPC Central Committee on Issues Concerning the Establishment of a Socialist Market Economic Structure" at the 3rd Plenum of the 14th CPC Congress in 1993. At that time, there were two urgent issues related to SOE reforms. The first issue involved restructuring the ownership structure of SOEs and building a modern corporate governance system, detaching government functions from enterprise functions, and establishing a stable nexus among stakeholders. The second issue was to adjust SOEs' industrial structure to improve their efficiencies and to solve loss-making problems.

As the first step, all SOEs were required to build a modern enterprise system with features of “clarified property rights, well-defined powers and responsibilities, separate government and enterprise functions, and scientific corporate governance” (State Economic Reform Commission, 1994). As the second step, the 15th CPC National Congress proposed to “focus on large SOEs while relaxing control over small ones”, i.e., the government continued to support large SOEs in key industries (the so-called lifeline or pillar industries), whereas small SOEs were asked to fend for themselves and were allowed to improve efficiencies through measures such as restructuring, alliances, mergers, management contracts, stock cooperative systems, leases, and sales, which established a competition mechanism of the “survival of the fittest”. As the third step, the 10th Five-Year Plan (2001-2005) proposed building a social security system independent of firms, relieving SOEs of their social burdens and creating a fair, level playing field for all firms.

Moreover, to help SOEs obtain external funding, lower leverage ratios, and escape their difficulties and to provide a secondary market for joint-stock companies, China’s stock market was established in the early 1990s with the Shenzhen and Shanghai exchanges. Since then, an increasing number of companies have been listed in those two exchanges, many of which are SOEs. Before the SOEs went public, a small portion of their ownership was sold to individual investors, private firms, mutual funds, or other institutional investors. However, this joint-stock system reform is far from complete because the state retains dominant ownership even after the firms’ IPOs.

3) Reform of the state-owned asset management system (2003-)

In 2003, a new state-owned asset management system was established based on the proposals of the 16th CPC Congress in 2002. Until that time, SOEs were uniformly owned by the State Council, their reform and management affairs were conducted under the guidance of the National Economic and Trade Commission, their long-run investments were made based on the approval of National Development and Planning

Commission, their short-run investments were made based on the approval of the ministries of their corresponding industries, their disposal of state-owned assets was made pursuant to the approval of Ministry of Finance, and their income distribution policies were conducted under the direction of the Ministry of Labor and Social Security. Under the new system, SOEs, according to their scale and importance, were owned by the State Council, provincial level governments, and local governments at lower administrative levels. A corresponding, specialized department—the State-owned Assets Supervision and Administration Commission (SASAC)—was established at different levels to implement the state owner’s power and responsibilities.

Since 2003, laws and regulations concerning the supervision and administration of state-owned assets have been enacted, structural adjustments have been advanced, an assessment of top managers’ performance has been performed, and the efficiencies of large SOEs have steadily improved. For example, the number of SOEs supervised by the SASAC of the State Council decreased from 196 in 2003 to 113 in 2012; currently, their annual revenues account for approximately 40 percent of China’s GDP and their net profit is approximately \$160 billion (nearly one trillion RMB) (SASAC of the State Council, 2012).

Although the Chinese government has made notable progress in SOE reform through institutional innovations and structural adjustments, it is too early to say that this reform has been an overall success. According to 2013 statistics from the Shanghai government, loss-making SOEs in Shanghai account for approximately one third of the total number of that city’s SOEs. SOEs that are subject to the State Council are always criticized for obtaining their huge profits through monopoly powers; thus, their profits are not equivalent to efficiency.

3.3.4.2 A theoretical analysis of SOE investment inefficiency

After more than three decades of reform, China's SOEs changed from entities under the control of the government to relatively independent competitors in the market. However, in a transitional economy such as China, there remain many drawbacks in both corporate governance and the institutional environment that can result in SOE investment inefficiency.

1) Inadequate incentives for SOE supervisors

Although there are many conflicts between shareholders and management in the modern corporate system, these conflicts have a new feature in SOEs, namely, an absent owner. By law, the owner of an SOE is the state; in practice, the state entrusts its assets in hundreds of enterprises to government departments. Each entrusted government department then assigns management to SOEs and plays a supervisory role. At present, the supervisors are SASACs of governments at various levels. However, the issue is that the SASACs are not the true owners, and SASACs do not have adequate incentives to supervise SOE management. First, the power to appoint or change SOE executives belongs to the CPC's organization department, whereas SASACs only have the power to assess SOE operational performance. Second, these executives typically enjoy (either implicitly or explicitly) certain administrative ranks according to the SOE's reporting hierarchy (Huang et al., 2011). As a system, however, executives' administrative ranks were abandoned in 2000. Accordingly, it is improper in Chinese political culture for a junior official to supervise superior executives of SOEs. For example, Jiang Jiemin, the former chief director of China Petroleum, is a member of the Central Committee of the CPC. Because Jiang's political rank is even higher than that of the SASAC head of the State Council, it is very difficult for the latter to truly supervise the former. Third, because executives of SOEs may become government leaders, the best policy for incumbent officials of SASACs is to cooperate with those executives. Again, consider the example of Jiang Jiemin, who was appointed as the head of the SASAC of the State Council after he left his position

at China Petroleum. One can imagine that an official who has not cooperated with China Petroleum would be astonished at the news of this designation.

To summarize, because SASAC officials do not have adequate incentives to supervise SOE behavior, SOE investment inefficiency arising from conflicts of interest and asymmetric information cannot be thoroughly contained under the current system.

2) Inadequate incentives for managers

SOE managers differ from their counterparts in non-state firms in many respects. First, because they are government-appointed, they cannot avoid government interference with their SOEs, and their discretionary powers are limited. Second, their compensation is largely defined by their administrative rank, and there is a weak relationship among compensation, performance, and contributions. Accordingly, SOE executives are undervalued compared to their counterparts in non-state firms. Third, when SOE performance improves, executives are rewarded with a bonus or promotion; when SOE performance decreases, executives are rarely penalized. Accordingly, their responsibilities are limited. Fourth, because SOE executives might become government officials, they do not serve repeated terms in SOE offices; knowing this, executives may make short-term decisions for the SOE's investments. Fifth, the colleagues of any individual executive are also appointed by the government, and they also have incentives to expand their sub-empires inside a large SOE. Therefore, each executive's Nash equilibrium involves avoiding the conflicts that arise from decreasing investments that relate to other divisions. Consequently, soft budget constraints also occur inside SOEs. Finally, because many SOE executives are not good at business administration, they are likely to make more mistakes in investment decisions. All of these reasons contribute to SOE investment inefficiency.

3) Policy burdens and soft budget constraints

Although the structural adjustments that started in 1997 have largely lightened SOEs' policy burdens, many of the remaining policy burdens have been the primary causes

of SOEs' soft budget constraints.

At least two social burdens: SOEs must maintain employment and pay retirement pensions. In times of difficulty, non-state firms can lay off employees to mitigate their disadvantages to some extent; conversely, SOEs have to increase employment, as in 2008. With respect to pensions, because the government refuses to cover old SOEs' retirement benefits⁷, the older an SOE is, the heavier its burden is of paying these pensions.

Two kinds of strategic burdens. On the one hand, most large SOEs in so-called pillar industries (capital- or technology-intensive industries) are not as competitive as their counterparts in developed economies. Second, many SOEs in so-called lifeline industries (such as railways and highways) cannot cover their investment and operation costs. Take the highway industry as an example. As noted by a spokesman for the Ministry of Transportation, until November 11, 2011, total loans for toll-road construction were approximately RMB 2.3 trillion, whereas toll earnings for 2010 were RMB 285.9 billion. All of the provinces have incurred losses after deducting loan expenses, taxes, road maintenance, operating expenses, depreciation, and amortization⁸. Although the government knows that both the investment and losses are huge, it still supports the highway industry, partly for its spillover effects on the automobile industry.

New policy burdens under the current tax-sharing system. Under the current tax-sharing system between central and local governments, GDP and tax contributions are simple and clear indicators for assessing local government leaders. Investment is an easy way to stimulate GDP and taxation, unlike private consumption, which is normally stable, and exports, which depend on foreign demands. To obtain good performance, political leaders tend to interfere with SOE investments, which may not

⁷ Namely, SOEs established in the age of the planned economy, when they were paid just enough for their work to cover expenses and their profits were used to develop capital-intensive heavy industries.

⁸ Source: <http://news.sohu.com/20111127/n327041590.shtml>.

be optimal as measured by the principle of business.

Political burdens. To implement the “Western China development strategy”, the government often assigns “political tasks” to SOEs, which is likely to induce many nonperforming investment projects.

In light of these policy burdens, it is natural for the government to pay the bill when SOEs report losses. However, the issue is that the government cannot easily distinguish losses arising from policy burdens from losses arising from SOE managers’ mistakes. Being aware of this, SOE managers are likely to overinvest.

4) *Soft equity constraints*

There are two cases in which SOEs experience soft equity constraints: equity financing and investment decision making.

The low costs of equity financing. According to the financing theory of pecking order, the cost of equity financing is generally higher than debt financing. However, China’s SOEs prefer equity financing to debt financing because of soft equity constraints. First, although the stock market’s financing function is abnormally emphasized, its function of improving resource allocation is neglected. Both the government and the intermediaries (including investment banks, accounting firms, and auditing firms) act on behalf of the listed companies instead of public investors; therefore, the cost of breaking laws or losing credit is much lower for Chinese listed companies. Second, as the Chinese government adopts a policy of financial repression (McKinnon, 1973), there are few channels for individual investment, and the supply of shares is limited under the IPO and SEO approval system: the offering prices of A shares⁹ are usually much higher. Third, Chinese listed companies adopt a policy of delivering either no or

⁹ A shares are denominated in RMB, offered and transferred in domestic market. There are also B shares, which are denominated in US dollars (on the Shanghai Exchange) or HK dollars (on the Shenzhen Exchange), offered and transferred among investors at home and abroad; H shares, denominated in HK dollars, offered and transferred in the Hong Kong market; N shares, denominated in US dollars, offered and transferred on the New York Exchange; and S shares, denominated in Singapore dollars, offered and transferred on the Singapore market.

few dividends. Consequently, in China, equity financing is generally more attractive than debt financing, and SOEs enjoy privileges in equity financing because of their governmental support.

Weakness of public shareholders. In many countries, the original purpose of establishing a stock market is to increase liquidity and help companies access an easier financing channel, whereas in China, the government must consider maintaining control of SOEs (Chen, 2005). To avoid criticism for selling state-owned assets, SOEs are only allowed to offer incremental shares to the public, and the state owner must retain control over listed SOEs. Moreover, before 2005, shares held by the state and legal persons were non-tradable on the stock exchanges. These institutional arrangements caused severe conflicts between public shareholders and non-tradable shareholders. The former receives few dividends and cannot influence SOEs' operation and investment decisions, and therefore, stock prices often widely deviated from companies' intrinsic value because of severe speculation. The latter does not care about stock prices unless seasoned equity offerings are needed because threats of takeovers do not exist¹⁰ and non-tradable shares can only be liquidated according to net asset value outside the exchanges. Accordingly, the distortion of the stock market damages the effectiveness of corporate governance.

After the reform of separate equity ownership in 2005 and 2006, non-tradable shares obtained marketability inside stock exchanges, and many shares that were previously held by the state owner or legal persons were liquidated. However, the state owner retains control over most blue-chip companies, and thus, there have been no fundamental changes in the corporate governance of these SOEs. By the end of 2011, capitalization of the Chinese stock market had reached RMB 26 trillion, 80 percent of which belongs to SOEs; this ratio is much higher than their proportion in the real economy.

¹⁰ On average, non-tradable shares account for approximately two-thirds of the capitalization of listed companies.

As mentioned above, SOEs can obtain cheap funds from equity financing, which decreases the capital costs of investment; moreover, because the state retains control, it is easy for SOE managers to pursue their private interests through overinvestment.

5) Soft debt constraints

The main instruments of debt financing in China include bank loans, corporate bonds issued by listed SOEs, and bonds issued by non-listed SOEs. Although bond issuance requires government approval, the determination of interest rates is dominated by the competition mechanism, and therefore, bonds impose tight constraints upon SOEs.

Conversely, because the bank loan market is still largely depressed, interest rates for bank loans are much lower than interest rates for bonds with the same term structures, and their constraints for SOEs are not tight for several reasons. First, the banking system is dominated by four state-owned banks¹¹ (Allen, Qian and Qian, 2005). Because the top managers of these state-owned banks are appointed by the government and SOEs can seek support from the government, SOEs enjoy privileges in the event of credit rationing. In this scenario, the risk of adverse selection increases. For example, government-supported companies have a higher ratio of nonperforming loans (Chen, 2010). Second, because SOE managers have incentives to obtain private benefits from overinvestment and because they know that the government normally will not dare to allow large SOEs to go bankrupt, their best choice is to waste cheaply obtained bank loans on “empire building” or on-the-job perks, thus introducing the moral hazard problem. Third, because the state-owned banks are simply another type of SOE, their top managers also do not have adequate incentives to take good care of state-owned assets. In brief, because SOEs and state-owned banks are like twin brothers, it is difficult to insert a market mechanism between them.

Because of the presence of soft constraints from bank loans, the discretionary

¹¹ Namely, the Industrial and Commercial Bank of China, the Bank of China, the China Construction Bank and the Agricultural Bank of China.

governance of debt cannot work, and SOEs are inclined to overinvest.

3.3.4.3 Inefficient investment in Chinese companies

It is only in recent years that Chinese companies' inefficient investment has become a topic of great interest among Chinese scholars.

According to agency theory and because of China's economic and political context, overinvestment can occur in China's listed companies. However, as Aggarwal and Samwick (2006) argue, because of owner absenteeism in Chinese SOEs and agency problems in both SOEs and non-state companies, the shirker effect may appear, which will cause underinvestment. Zhang and Song (2009) propose a new model to measure inefficient investment by listed Chinese industrial companies and report that 39.2% of their sampled companies overinvest, whereas 60.74% underinvest. Wang and Sun (2009) also report overinvestment in Chinese listed companies based on an empirical study. These authors show that free cash flow significantly and positively influences firms' investment behavior, ownership concentration, and ownership proportion of the biggest shareholder, which can alleviate overinvestment to some extent; however, debt—namely, leverage—does not have a significant relation to investment behaviors.

Many scholars have investigated the correlation between inefficient investment and various factors such as free cash flow, government intervention, corporate governance, and CEO incumbent status.

Li and Xiao (2012) study the relation between CEO tenure and a listed firm's investment. They find that companies with longer CEO tenure will have higher investment levels; conversely, companies with shorter prospective CEO tenure will have lower investment levels. This tendency is the same for both SOE and non-state-owned companies. That said, SOEs and private companies are influenced

differently by the relation between CEO tenure and firms' investment efficiency. For SOEs, overinvestment is more severe in the companies with longer CEO tenure, and it will be mitigated more in companies with shorter prospective CEO tenure. The authors do not find this relation in non-state-owned companies. Guo and Wang (2012) studied 710 listed SOEs in 2006 and find that both overinvestment and free cash flow are positively related to the magnitude of overinvestment. State institutional ownership, leverage rate, ownership scale, and deviation of control have a negative impact on overinvestment. Convertible bonds are also reported to mitigate firm investment both because their fixed interest rates decrease managers' disposable free cash and because creditors more actively monitor managers' behavior (Xu, 2014).

SOEs have many burdens, including employment, medical care, and retirement benefits, among others. To support SOEs, China's central government gives them a special subsidy or helps them more easily obtain factors of production. Relatively cheap and easy access to the factors of production drives SOEs to invest more. Fiscal decentralization is regarded as a possible solution to this problem. Li and Gao (2010) thoroughly study this issue by checking the correlation between fiscal decentralization and overinvestment. They argue that although fiscal decentralization can alleviate this problem, it cannot solve it. Tang and Luo (2014) focus their study on local SOEs in the fiscal decentralization context and argue that leverage has a significant and positive correlation with the degree of local SOE overinvestment; moreover, in areas experiencing a more exacting scale of fiscal decentralization, overinvestment has a greater influence on the debt rate.

Financing constraint is a key factor that influences firms' investment behavior. Based on an empirical study of Chinese listed companies, Luo et al. (2012) argue that bank credit significantly boosts a firm's overinvestment in SOEs but does not significantly influence private firms' investment decisions. This finding reveals the different levels of financing efficiency among enterprises with different types of ownership. Equity-based refinancing is often used by Chinese listed companies. Qu and Yang

(2013) report that equity-based refinancing has a significant and positive correlation with firm overinvestment; compared to listed private companies, SOEs engage in much more extensive overinvestment because of equity-based refinancing. The authors also argue that this finding is evidence of tunneling behaviors by a firm's controlling shareholders.

Some scholars also investigate firm overinvestment behavior related to the influence of government intervention. Xiang et al. (2014) find that at the initial stage of a local governor's tenure, intervention in local SOEs is small, and therefore, local SOEs' overinvestment is weak; the longer a local governor's tenure is, the greater the intervention in local SOEs is; therefore, local SOEs' engage in more extensive overinvestment. However, when a local governor is about to leave his or her position, the magnitude of overinvestment drops dramatically. Wu and Yu (2009) report that overinvestment is much more extensive in local SOEs than in local private companies and argue that intervention from local government aggravates firms' overinvestment. Zhang et al. (2014) also document the positive relation between government intervention and firm overinvestment and note that diversification is one of the most important types of overinvestment in firms, especially SOEs.

3.4 Hypothesis Development

The relationship between shareholders and management in Chinese SOEs is unique and differs from that described by traditional agency-cost theory, which is primarily based on asymmetrical information. By law, SOEs are owned by the state, but the problem is the question of who the state is: in practice, the state entrusts local governments, and governments empower governors to manage SOEs. Owner absenteeism causes large problems in SOEs (Aggarwal and Samwick, 2006) because there is no clear ownership: local governments and governors do not have sufficient motivation to monitor SOE management. When there is an agency problem between the state and the governors who are appointed to manage SOEs, there is also another

agency problem between SOE management and the governors, who themselves are the agents of the state (Xu and Yan, 2011).

The state normally holds majority ownership in listed SOEs. Simultaneously, institutional and individual activism is weak (e.g. Weng, 2008; Sun and Liu, 2009) and thus, the severe agency problems in SOEs may have negative consequences. To pursue their own interests, managers may act to maximize their own benefits, hurting the firm's long-term interests (Wang, 2000).

Thus, the thesis presents the following hypothesis:

Hypothesis 2a: Among Chinese publicly listed companies SOE attribute has a positive relation to firm's investment.

Hypothesis 2b: In general, Chinese listed SOEs engage in overinvestment.

3.5 Research Methodology

3.5.1 Samples

The samples include non-financial companies listed on both the Shanghai Stock Exchange and the Shenzhen Stock Exchange. As in the previous study, financial companies are excluded from the sample because their assets and financing situations are very different from those of non-financial companies. Again, this thesis chooses data from A shares only, and the data are the same as in the study described in Chapter 2.

To check the hypothesis in this chapter, the thesis uses many accounting items such as Tobin's Q, cash flow, fixed assets, annual revenue, and financial leverage. All of these data can be obtained from the CSMAR database.

One issue that needs to be highlighted is that because the thesis verifies two hypotheses in this chapter, the data for Hypothesis 2a and 2b are different. For

Hypothesis 2a, the thesis uses the sample that contains listed SOEs and non-SOE listed companies. However, for Hypothesis 2b, the thesis only uses samples based on all listed SOEs. Thus, the number of samples (firm-year observations) for the first empirical study to test Hypothesis 2a in this Chapter becomes 9897. To check the hypothesis 2b, this thesis conducts four regressions. The first regression is conducted on the samples including all firms, the second regression is conducted on the subsamples including all SOEs, the third regression is conducted on the subsamples including all local SOEs and the fourth regression is conducted on the subsamples including only central SOEs. Obviously, the number of samples for these regressions becomes smaller and smaller. Sample number of the first regression is 9897, that of the second regression is 5297; the third regression contains 4622 samples while the last regression only has 675 samples.

3.5.2 Research method

The goal of this chapter is to verify two hypotheses: (1) Among Chinese publicly listed companies SOE attribute has a positive relation to firm's investment; and (2) in general, Chinese listed SOEs overinvest. Below is the description of the research method for these two hypotheses.

a) Research method for Hypothesis 2a: Among Chinese publicly listed companies SOE attribute has a positive relation to firm's investment.

To check Hypothesis 2a, the thesis refers to Richardson's (2006) method and divides the method into 3 steps, which are illustrated below.

The thesis separates the firm's total investment into two parts. The first part is the investment amount that maintains the firm's existing assets. The second part is the total investment in new projects (Strong and Meyer, 1990; Richardson, 2006).

$$I_{total} = I_{maintenance} + I_{new} \quad (3-1)$$

Amortization and depreciation can be a proxy for $I_{\text{maintenance}}$, which is necessary to maintain the firm's plant, machinery, and other facilities.

Based on investment efficiency, the thesis then decomposes I_{new} into two additional parts. Investment in the projects that can generate positive NPV is the expected investment and the normal part, whereas investment in the projects that only generate negative NPV is the unexpected investment and the abnormal part.

$$I_{\text{new}} = I_{\text{expected}} + I_{\text{unexpected}} \quad (3-2)$$

The unexpected investment part can be either positive or negative. When it is positive, I_{new} is bigger than the expected investment level, which indicates overinvestment. When it is negative, I_{new} is smaller than the expected investment level, which indicates underinvestment.

There are many studies that discuss the determinants of firms' investment decisions (e.g., Hubbard, 1998; Brito and John, 2001; Wang and Sun 2009), including growth opportunity, financial leverage, cash, and firm size, among others. Thus, the thesis constructs a model to predict the firm's new investment level. If the firm's investment can be explained by the model, it belongs to the expected part; the actual investment that cannot be explained by the model is the unexpected part. Note here that the expected part derived from the model can be either higher or lower than the firm's actual investment amount. In theory, the difference between the firm's actual investment amount and the model's investment prediction can be obtained by calculating the residuals of the regression. See Figure 3.3 below for illustration.

[Figure 3.3]

From formula 3-1 above, we can easily obtain the following:

$$I_{new} = I_{total} - I_{maintenance} \quad (3-3)$$

All of the elements that compose I_{total} and $I_{maintenance}$ for each listed company are reported in the firm's annual report and are available in the CSMAR database. Therefore, I_{new} can be calculated from these data and it is easy to obtain each company's actual new investment level. The thesis runs a regression based on I_{new} as the dependent variable and all of the other investment determinants mentioned earlier as independent variables to predict the firm's new investment, which the thesis marks as I_{new}^* . According to the regression definition, the difference between I_{new} and I_{new}^* comprises the residuals of the regression. Thus, the following equation can be obtained:

$$I_{new} = I_{expected} + I_{unexpected}$$

$$I_{new} = I_{new}^* + \varepsilon \quad (3-4)$$

where $(I_{new}^* = \alpha + \beta_1 GROWTH + \sum_2^n \beta INVESTMENT\ factors)$ and ε is the regression residual that is equal to $I_{unexpected}$.

Thus, this thesis can calculate regression residuals and judge the firm's investment situation based on the signs of the regression residuals. If the sign is positive, the firm overinvests; if the sign is negative, the firm underinvests.

The thesis then performs another regression in which $I_{unexpected}$ —namely, the residuals of the regression presented in equations 3-4 — is the dependent variable. The independent variables contain dummy variables (including SOE attribute and free cash flow status), along with accounting and financial items such as leverage, gross margin, and an ownership attribute variable. The coefficient of SOE attribute denotes the relationship between SOE attribute and $I_{unexpected}$. If the coefficient is significant and the sign is positive, then SOE attribute will cause the firm to invest more, thus

proving Hypothesis 2a.

b) Research method for Hypothesis 2b: In general, listed SOEs overinvest.

Hypothesis 2b argues that Chinese listed SOEs generally engage in overinvestment. The thesis borrows empirical methods used by Vogt (1994) and Mei (2005) in this research.

Financing constraints have a substantial impact on a firm's investment decisions. Myers and Majluf (1984) argue that insiders have better information than outsiders about a company's value in the capital market. To offset the risks caused by asymmetric information, capital lenders normally require higher returns on the funds that they lend. However, high interest rates may make positive-NPV projects unprofitable; therefore, adverse selection occurs in the capital market in that firms with a tight inside cash flow are required to forgo good positive-NPV projects because of high external financing costs. The authors thus formulate a pecking order (PO) hypothesis, which provides that firms prefer to use internal funds for investment instead of debt or equity-based financing. Because of financing constraints, if firms cannot generate sufficient cash flow for all of their positive-NPV projects, the firm is underinvested.

Conversely, agency problems also play an important role in a firm's investment decisions. Many scholars find that managers' pecuniary and non-pecuniary income are positively related to company size, and managers in bigger companies have much higher incomes than managers in smaller companies (e.g., Conyon and Murphy, 2000). Thus, managers are more likely to overinvest in negative-NPV projects to obtain more benefits based on an increased company size (Jensen and Meckling, 1976; Jensen, 1986).

Based on the two scenarios set forth above, this thesis infers that with a firm's increasing opportunities to invest in positive-NPV projects, the sensitivity between

free cash flow and investment becomes tighter, meaning that the firm experiences financing constraints and underinvestment occurs. Conversely, with a firm's decreasing opportunities to invest in positive-NPV projects, the sensitivity between free cash flow and investment becomes tighter, meaning that the firm experiences agency problems and overinvestment occurs.

Similar to the method used by Vogt (1994) and Mei (2005), the thesis first constructs a model describing the value of a firm's investment, including growth measures, accounting measures, the impact of company size, and the annual fix effect.

$$I = \alpha + \beta_1 CASHFLOW + \sum_2^n \beta OTHER INVESTMENT factors \quad (3-5)$$

In equation 3-5, **I** stands for the firm's investment, and **β_1** reflects the correlation between free cash flow and firm investment. Other investment factors include cash stock, growth opportunities (measured by Tobin's Q), annual sales, yearly effect, and industrial impact.

To identify whether financing constraints or agency problems have a greater influence on firm investment, this study introduces the interaction between cash flow and Tobin's Q as a new independent variable in the above equation. Therefore, the equation becomes

$$I = \alpha + \beta_1 CASHFLOW + \beta_2 CASHFLOW \times Q + \sum_3^n \beta Other INVESTMENT factors \quad (3-6)$$

In equation 3-6, $CASHFLOW \times Q$ is the interaction of free cash flow and Tobin's Q (namely, investment opportunities). The other variables remain the same as in

equation 3-5.

The purpose of $CASHFLOW \times Q$ is to investigate what factor induces sensitivity between investment and free cash flow in the firm. If the model presented in 3-6 is linear, then the coefficient of $CASHFLOW \times Q$, β_2 will be the following:

$$\beta_2 = \frac{\delta I}{\delta CASHFLOW \times \delta Q} \quad (3-7)$$

Thus, $\beta_2 = \frac{\delta I / \delta CASHFLOW}{\delta Q}$, because $\frac{I}{CASHFLOW}$ equals to the coefficient of CASHFLOW. Therefore, equation 3-7 can be written as

$$\beta_2 = \frac{\delta \beta_1}{\delta Q} \quad (3-8)$$

Indeed, $\frac{\delta \beta_1}{\delta Q}$ is the first-order derivative of $\frac{\beta_1}{Q}$, and thus,

$$\beta_2 = \left(\frac{\beta_1}{Q} \right)' \quad (3-9)$$

Based on calculus principles, it can be inferred that

- 1) If $\beta_2 > 0$, then β_1 and Q are consistent with the relation of an increasing function, that is, when Q becomes larger (namely, when there are more investment opportunities), sensitivity between free cash flow and investment will be tighter, the firm will experience financing constraints and lack sufficient money to fund positive projects, and the firm will thus be underinvested.
- 2) If $\beta_2 < 0$, then β_1 and Q are consistent with the relation of a decreasing function, that is, when Q becomes smaller (namely, when there are fewer investment opportunities), sensitivity between free cash flow and investment will be tighter, the firm will experience agency problems, managers will invest in projects with negative NPVs based on their

personal benefits, and the firm will thus be overinvested.

In summary, the sign of the regression coefficient of the interaction variable indicates a firm's investment status. A positive sign indicates underinvestment, whereas a negative sign indicates overinvestment.

3.5.3 Variables

a) Variable definition for Hypothesis 2a: Among Chinese publicly listed companies SOE attribute has a positive relation to firm's investment.

The dependent variable of regression for Hypothesis 2a is I_{new} . As mentioned above, I_{new} equals total investment minus expenditure to maintain existing assets. A detailed definition is provided below.

$$I_{\text{new}} = I_{\text{total}} - I_{\text{maintenance}}$$

In which

$$I_{\text{total}} = \text{CAPEX} + \text{Acquisition} + \text{R\&D} - \text{SalePPE}$$

$$I_{\text{maintenance}} = \text{Depreciation} + \text{Amorization}$$

Many scholars have discussed the determinants that can influence firm investment behaviors (e.g., Hubbard, 1998; Guo and Wang, 2012). Based on these studies and Richardson (2007) model, the thesis chooses variables that measure a firm's growth opportunities, debt ratio, cash stock, company age, company size, stock return, yearly-fixed effects, and industry-fixed effects. Why the regression does not include provincial-fixed effects is because although listed firms are registered in different provinces, they can make investments across China and overseas freely, so firms' registered provinces do not matter with their investment amount. The first step in verifying Hypothesis 2a is to obtain a firm's proper new investment level so that the thesis can calculate the difference between the appropriate new investment level and the actual new investment level, namely, the residuals of the regression. The table 3.1

below presents details for the regression's dependent and independent variables to predict a firm's appropriate new investment level.

[Table 3.1]

In Table 3.1, all independent variables are divided into three groups. Firm's average Tobin's Q and Company age represent firm's growth opportunities. Cash stock, leverage (debt rate), company size and stock return represent firm's financing constraints. Fixed effects include industry dummy and year dummy. The standard approach in the literature has been to use market price relative to some measure of fundamental value to determine growth opportunities. Tobin's Q (the ratio of the market value of assets to the current replacement cost of those assets) is the most widely used measure of growth opportunities (Narayanan, 1988; Vogt, 1994; Richardson, 2007). Firm level investment is lessened when firms are more difficult to raise additional cash to finance the new investment as captured by firm maturity, leverage, firm size, and level of cash (e.g., Fazzari et al., 1988; Hubbard, 1998). A prior year stock return is included as an additional variable to reflect growth opportunities not reflected in Tobin's Q as Richardson (2007) did. Prior firm level investment is also included to represent non-modeled firm characteristics that impact investing decisions. This thesis also includes indicator variables, as dummy variables, for industry membership and temporal effects to capture additional variation in investment expenditure that are not explained by the measures of growth opportunities and financing constraints. One important note is that including these additional variables may reduce the power of tests to capture firm overinvestment. For instance, if over-investment is concentrated in some specific industry groups, in particular time periods or is concentrated in firms of a certain sector then the model may inappropriately classify abnormal investment as normal investment. To address this possibility, multiple investment expectation models are examined later on in this thesis.

Based on the above regression, the study can obtain the firm's proper new investment level, which this thesis names pI_{new} , and the thesis then calculates the firm's free cash

flow. Free cash flow is the cash flow that is greater than what is necessary to maintain existing assets and debts and to finance the firm's optimal new investments. To calculate free cash flow, the following components are required:

- 1) CF_{EAD} : Cash flow from existing assets and debts;
- 2) $I_{maintenance}$: Expenditure of investment necessary to maintain existing assets; and
- 3) pI_{new} : Predicted expenditure of new investment that finances good projects.

$$CF_{EAD} = CFO - I_{maintenance} + RND \quad (3-10a)$$

As shown in equation 3-10a, CF_{EAD} equals a firm's operating cash flow (CFO) minus $I_{maintenance}$ plus R&D expenditures. The reason that R&D expenditures should be added to CF_{EAD} is that accounting regulations require firms to make R&D expenditures; therefore, R&D expenditures are deducted from the firm's operating cash flow.

A firm's free cash flow can be obtained from the difference between CF_{EAD} and the firm's expected new investment, pI_{new} .

$$FCF = CF_{EAD} - pI_{new} \quad (3-10b)$$

the thesis then constructs two dummy variables to describe FCF, as set forth below:

$$FCF_{positive} = 1 \text{ if } FCF > 0, \text{ otherwise } FCF_{positive} = 0$$

$$FCF_{negative} = 1 \text{ if } FCF < 0, \text{ otherwise } FCF_{negative} = 0$$

As mentioned previously, the regression residuals for Table 3.1 are the measures of a firm's investment situation. This thesis names the residual I_{newerr} ; its sign indicates whether the firm is overinvested (when its sign is positive) or underinvested (when its sign is negative). The abstract values of I_{newerr} reflect the magnitude of over- or underinvestment.

To verify Hypothesis 2a about whether SOE attribute is positively related to firm's unexpected investment, this thesis makes the second regression, which includes I_{newerr} as the dependent variable and $FCF_{positive}$, $FCF_{negative}$, $SOETAG$, and components reflecting firm features as independent variables. Table 3.2 presents the details.

[Table 3.2]

b) Variable definition for Hypothesis 2b: In general, Chinese listed SOEs engage in overinvestment.

Hypothesis 2b argues that in general, Chinese listed SOEs are overinvested. To verify this hypothesis, as mentioned in equations 3-5 and 3-6, this study runs a regression between a firm's investment level and cash flow, investment opportunity measured by Tobin's Q, interaction of cash flow and Tobin's Q, debt rate, cash amount, company size, year indicator, and industry indicator. As state earlier, these variables are tightly related to firm's investment, similar to the regression in Hypothesis 2a, the thesis also puts these variables into regressions to capture firm's investment. Table 3.3 provides details.

[Table 3.3]

3.5.4 Models

3.5.4.1 Models for Hypothesis 2a

The first step is to make a fixed-effects panel data estimator¹² that predicts a firm's appropriate new investment level. Referring to Richardson's (2006) and Guariglia and

¹² A Hausman test is conducted to check whether fixed effect model or random effect model should be deployed.

H0: difference in coefficients between fixed effect and random effect model is not systematic

Chi2(9)=112.05; Prob>chi2 = 0.0000. So fixed effect model should be selected.

Yang (2016) method, a fixed-effects panel data model is used to predict the expected investment expenditure in new positive NPV projects, which can be interpreted as the optimal level of investment expenditure. Specifically, denoting with Tobin's Q, with Cash, its ratio of cash and cash equivalents to total assets; with Sales Revenue¹³, the natural logarithm of its total annual sales revenue; with Company Age, the number of years elapsed since its listing; with Stockreturn, its return on stocks; and with Leverage, the ratio of its short-term and long-term debt to total assets, the thesis estimates the following equation:

$$\begin{aligned}
 Inew_{i,t} = & \alpha + \beta_1 Lever_{i,t-1} + \beta_2 Cash_{i,t-1} + \beta_3 Companyage_{i,t} \\
 & + \beta_4 Lnrev_{i,t-1} + \beta_5 Stockretrun_{i,t-1} + \beta_6 TobinQ_{i,t-1} \\
 & + \mu_i + \mu_t + \mu_j + \varepsilon_{i,t}
 \end{aligned}
 \tag{3-11}$$

Where the subscript i indexes firms; t indexes years and j indexes industry. The thesis lags all independent variables except companyage to alleviate the simultaneity issue (Duchin et al., 2010). The error term in equation 3-11 is made up of four components. μ_i is a firm-specific effect; μ_t is a time-specific effect, which the thesis controls for by including year dummies capturing business cycle effects; μ_j is an industry-specific effect which the thesis takes into account by including industry dummies; Finally $\varepsilon_{i,t}$ is an idiosyncratic component.

Based on the above regression, the thesis can predict a firm's appropriate new investment level, pI_{new} . Next, this thesis calculates the firm's free cash flow and constructs $FCF_{positive}$ and $FCF_{negative}$ according to the methods described in Table 3.2.

I_{newerr} , the difference between a firm's actual new investment and predicted new investment, can be obtained from the residuals of the above regression. To verify

¹³ The thesis will use both annual sales revenue (Lnrev) and total assets (Lnsize) as proxy of firm size. Section §3.6.1.2 reports four panels, coefficient of firm's annual sales revenue is not significant in the third panel, so the thesis chooses total asset as firm size proxy in the fourth panel.

whether SOE attribute is positively associated with firm's inefficient investment in Chinese listed SOEs, another pooled panel regression is conducted, as set forth below:

$$\begin{aligned}
I_{newerr} = & \alpha + \beta_1 FCF_{positive} + \beta_2 FCF_{negative} + \beta_3 SOE \text{ Attribute} \\
& + \beta_4 Blockholder + \beta_5 Grossm + Year \text{ Dummy} \\
& + Industry \text{ Dummy} + \varepsilon
\end{aligned}
\tag{3-12}$$

As previously discuss, I_{newerr} denotes a firm's investment situation; if I_{newerr} is positive, the firm is overinvested, whereas if I_{newerr} is negative, the firm is underinvested. In addition, abstract values of I_{newerr} indicate firms' overinvestment or underinvestment scale. The study runs regressions for all of the samples. In the four panels, the thesis will put different SOE attribute dummy variable (i.e. SOETAG, LOCALTAG and Centralsoe) into the regressions and signs of β_3 will be checked; if the signs are positive and the coefficient is significant, Hypothesis 2a can be proven.

3.5.4.2 Models for Hypothesis 2b.

Hypothesis 2b argues that in general, Chinese listed SOEs are overinvested. Following Vogt (1994) and Mei (2005), this thesis introduces the model below to check the relationship between investment-FCF (free cash flow) sensitivity and Tobin's Q to reveal whether such sensitivity is caused by financing constraints or agency problems. Agency problems in the firm lead to overinvestment, whereas financing constraints normally induce underinvestment.

$$\begin{aligned}
Newinvest = & \alpha + \beta_1 TobinQ_{t-1} + \beta_2 lever_{t-1} + \beta_3 CF + \beta_4 sales_{t-1} \\
& + \beta_5 TobinQ_{t-1} \times CF + \beta_6 CA_{t-1} + \beta_7 Size \text{ Dummy} \\
& + \beta_8 Year \text{ Dummy} + \beta_9 Industry \text{ Dummy} + \varepsilon
\end{aligned}
\tag{3-13}$$

In the above equation, because Tobin's Q, debt rate, annual sales revenue, and cash amount have a lagged effect on firm investment, the thesis uses the one period-lagged value of the abovementioned variables for the regression. Note that variables with financial values are scaled by the firm's one-period lagged fixed assets on both sides of the equation to eliminate unit dimensions.

To verify Hypothesis 2b, the thesis runs this pooled panel regression on the samples of all SOE companies (SOETAG=1) and check the sign of interaction item. As a comparison, the thesis also runs the regression on all of the samples so this study can investigate the investment situation in both SOEs and all Chinese listed companies.

3.6 Empirical Results

3.6.1 Results of the empirical study for Hypothesis 2a

3.6.1.1 Variable descriptive statistics

Table 3.4 presents descriptive statistics for the variables in the regression for equation 3-11.

[Table 3.4]

Because the original data contain data from various industries and from different years, there are some singular values in the samples, making the standard deviations of both the dependent and independent variables abnormally large. To eliminate the influences of these singular values in the regression, the thesis winsorized all of the variables (except for Companyage and Lnrev) at the 0.01 level. Table 3.4 shows the descriptive statistics after the Winsorized operation.

Table 3.5 shows the correlations among the variables in regression to predicate firm's

new investment, namely equation 3-11. The maximum correlation is -0.3771 between $\ln rev$ and TobinQ, and other absolute values of the correlations are generally lower than 0.35, thus indicating that multicollinearity is not significant and that it is unnecessary for us to create a special treatment for panel 3-11.

[Table 3.5]

3.6.1.2 Regression Results

Table 3.6 reports the results of the regression that predict a firm's investment level based on a fixed effects panel data model. As discussed previously, the regression's residuals will indicate a firm's over- or underinvestment.

[Table 3.6]

The regressions are based on fixed effects panel data models. This thesis presents the results of the four panels in Table 3.6.

In the first model, the thesis only considered the firm's investment opportunities, which are measured by Tobin's Q. Firms with more investment opportunities—namely, firms with a high Tobin's Q—will typically have higher investment expenditures (Narayanan, 1988), and thus, the thesis predicts that the coefficient sign of Tobin's Q will be positive. This result is consistent with the argument that Tobin's Q is significantly and positively related to a firm's investment expenditure. However, the adjusted R-squared of this model is quite low—less than 1%—which indicates that the model missed many other factors in this model.

This thesis presents the influence of industry dummy variables and year dummy variables in model II. The result shows that industry and year play significant roles in determining a firm's investment level. The R-squared of model II is 2.1%, which

together with an F value of 31.1 denotes that year and industry are significant factors influencing a firm's investment level. Therefore, year and industry should be adopted in the following models.

Model III reports other variables (except for Tobin's Q) that influence a firm's investment decisions. Like Richardson (2006), this thesis includes the firm's debt rate, cash stock, stock return, company size, and company age in the model. Unlike Richardson, in model 3, this thesis uses the firm's annual revenue—not the firm's total assets—as the measure of firm size because some companies may not have big total fix assets even they are big companies such as trading companies and high-tech companies thus some scholars choose firm annual sales revenue as a proxy for firm size (e.g., Core et al., 1999; Ozkan, 2007); Zhou (2010) also reports a correlation between firm revenue and firm investment. Most of the predicted signs of the abovementioned variables are positive, except for firm debt rate and company age. According to Jensen (1986) and Lang et al. (1996), financing constraints will cause firms either to underinvest or to control the degree of overinvestment; therefore, the predicted sign of the debt rate is negative. Older firms normally have greater total assets and thus have lower growth rates because of the scale effect (Xie, 2005; Song and Huang, 2012). The thesis predicts that there is a negative relation between company age and firm investment level, and therefore, the sign is negative. The results support all predictions and indicate that company age and debt rate are negatively related to firm investment level but that cash stock, stock return, and revenue are positively related to investment level. However, the relation between firm's revenue and firm's investment is not significant in this model. So, in model IV, this thesis will choose firm total assets as the proxy of firm size. All of the coefficients of the variables in model III are significant except Lnrev, with within R-squared of 3.6% and an F value of 58.89. These outputs show that the variables are relevant in explaining firms' investment decisions, but because of low R-squared value, it seems that the model misses some important variables; the thesis then will introduce one period lagged firm investment as an independent variable later in this

chapter.

Model IV includes all of the variables from model I to model III, but substitute firm annual sales revenue (Lnrev) with firm total assets (Lnsize) as the proxy of firm size. Thus, the explanatory power slightly increased to 5.1%. All of the control variables comply with the expectation that a firm's new investment decreases with company age and debt rate and increases with cash stock, stock return, firm size and growth opportunities. All of the coefficients are significant. Again, the within R-squared value is small so the thesis will introduce one period lagged firm investment as an independent variable later in this chapter.

This thesis then uses model IV to predict the firm's new investment (namely, pInew) to calculate free cash flow in equation 3-12. Localtag is the dummy variable to identify SOEs owned by the local government, whereas centralsoe identifies SOEs owned by the central government. Refer to Table 2.2 and Table 3.2 for detailed definitions of each variable. Table 3.7 provides descriptive statistics of the variables in regression 3-12.

[Table 3.7]

To test Hypothesis 2a, the thesis runs equation 3-12 based on four panels. The results of the regressions are presented in Table 3.8.

This thesis checks the relation between a firm's unexpected investment and the SOE attribute dummy variable in all of the samples in the first panel. In the second and third panel, the thesis substitutes SOE attribute with local SOE attribute and central SOE attribute, respectively. In the fourth panel, the thesis puts both CENTRALSOE and LOCALTAG into the regression. Note that both CENTRALSOE and LOCALTAG comprise the subset of SOETAG .

[Table 3.8]

The result of panel I supports the hypothesis 2a. All of the coefficients are significant, and the F value is 50.96, thus indicating that the regression is meaningful. Consistent with both agency theory and many previous studies (e.g., Wang and Sun, 2009; Zhou and Wang, 2011), ownership concentration is negatively related to unexpected investment. This result reflects how major shareholders play effective roles in controlling and monitoring management in listed Chinese companies. A firm's business operational margin has a negative influence on the investment level. This result does not consist with the financing constraint hypothesis, which holds that if a firm has a higher operational margin and thus more disposable funds, it is more likely to engage in additional investment if other conditions remain the same. This may be because the firms with higher operating margin have better management thus they can prevent overinvestment in general. $FCF_{negative}$ and $FCF_{positive}$ are equal to FCF for values of FCF less or greater than zero. This allows the relation between over-investment and free cash flow to be asymmetric (Richardson, 2006). In particular, the slope coefficient based on the sign of free cash flow reveals that over-investment is concentrated in firms with positive free cash flow. The coefficient of negative FCF is 0.069 and the coefficient of positive FCF is 0.075, significantly¹⁴ different at the 1% level. When firms do not have free cash flow, (i.e., FCF is negative) the possibility of over-investment is mitigated because the firm is forced to access external financial markets to raise funds necessary to support any additional investment. Thus capital markets serve a monitoring role in disciplining managerial use of funds. The regression results in Table 3.8 shows that firms with positive free cash flow are more likely to over-invest on average. This result supports the financing constraint hypothesis. The regression results in Table 3.8 also relate to under-investment. The positive coefficient on β_2 indicates that firms with negative free cash flow experience less over-investment. This relation is consistent with the

¹⁴To test heterogeneity of coefficients of $FCF_{positive}$ and $FCF_{negative}$, the F-test is constructed.

$H_0: \beta_1 = \beta_2$; $H_1: \beta_1 \neq \beta_2$.

Testing Results: $t=26.18$, $p=0.000$. So the two coefficients are significantly different.

understanding that firms subject to cash short falls from operating activities scale back on their investment activities. However it is necessary to note that the strength of the relation between abnormal investment and free cash flow is relieved for firms with negative free cash flow because these firms may be able to raise additional cash from external financial markets to support their investment. SOETAG is significantly and positively related to the firm's unexpected investment. This result implies that when other conditions remain the same, SOEs will engage in more investment than non-SOEs. Furthermore, SOE attribute is associated with more investment in Chinese public listed firms, thus proving Hypothesis 2a.

To further investigate the relation between SOE attributes and a firm's investments, this thesis substitutes SOE attribute with local SOE and central SOE in panel II and III respectively. The regression result of panel II shows that local SOEs engage in more unexpected investment than other firms, but the regression result of panel III reveals that central-SOE attribute has a positive—but not significant—relation to a firm's unexpected investment. This finding is interesting, and some previous studies may provide an explanation for the difference. Zhao and Hao (2013) find that because local governments are motivated to win the GDP competition, local governments tend to intervene in SOEs, and such interventions normally cause overinvestment. However, local government intervention has a much weaker influence on central SOEs than it does on local SOEs. Hao and Liu (2011) argue that because central SOEs are directly managed by the SASAC (State-owned Assets Supervision and Administration Commission), central SOEs more easily bypass the intervention of local governments. Meanwhile, some authors (Li and Gao, 2010; Tang and Luo, 2014) reveal that fiscal decentralization is a reason for overinvestment by local SOEs. They argue that because of fiscal decentralization, local governments assume too many responsibilities related to fiscal expenditure. However, local governments cannot rely solely on fiscal income, and therefore, they have the motivation and ability to shift some of these burdens to local SOEs by intervening in local SOE investment and financing behaviors. These authors find that local SOEs that are more

overinvested generally shoulder higher debt rates, a finding that is consistent with their argument.

In panel IV, the thesis puts both CENTRALSOE and LOCALTAG into the regression. The signs of all coefficients remain the same as in panel II and panel III. Both LOCALTAG and CENTRALSOE show a positive relation with firm's unexpected investment with significance at 0.01 level.

3.6.2 Results of the empirical study for Hypothesis 2b

3.6.2.1 Variable descriptive statistics

Table 3.9 gives variable descriptive statistics of the regression listed in equation 3-13. To eliminate the influences of these singular values on the regression, the thesis Winsorized newinvest, CF, CA, TobinQ, and lever at the 0.01 level. Table 3.9 shows the descriptive statistics after the Winsor operation.

[Table 3.9]

3.6.2.2 Regression results

Table 3.10 gives the results of the regressions to check firms' overinvestment status, as discussed in equation 3-13.

[Table 3.10]

The results for the four models are presented in Table 3.10. The first model is conducted using the full samples, including both SOEs and non-SOEs. In the second model, the thesis runs the regression on the SOEs only. Models three and four report the results of regressions in local SOEs and central SOEs, respectively.

Hypothesis 2b argues that Chinese listed SOEs generally overinvest. Financing constraints have a substantial impact on firms' investment decisions. This thesis infers that if the sensitivity between free cash flow and investment becomes tighter with an increase in a firm's opportunities to invest in positive-NPV projects, the firm experiences financing constraints and underinvestment occurs. Conversely, if the sensitivity between free cash flow and investment opportunities becomes tighter with a decrease in a firm's opportunities to invest in positive-NPV projects, the firm experiences agency problems and overinvestment occurs. This thesis uses the interaction **Cashflow**×**Q** to represent the sensitivity between free cash flow and investment opportunities. If the regression coefficient of QCFC is positive, the firm is underinvested; if the sign is negative, the firm is overinvested.

Model one is analyzed for all of the sampled companies. A firm's investment opportunities (measured by Tobin's Q), cash flow, sales revenue, amount of cash stock, and size are positively related to its annual investment amount, but debt rate (lever) has a negative relation to annual investment amount. The results comply with financing constraint theory and are similar to those of Mei's (2005) study. The sign of coefficient of interaction **Cashflow**×**Q** (namely QCFC) is negative, and it is significant at the 1% level. This indicates that listed Chinese companies are generally overinvested.

The thesis deletes non-SOE companies from the sample and rerun the regression in the second model so that the study can check cash flow and investment opportunity sensitivity among Chinese listed SOEs. The results are similar to those of model one: all of the signs remain the same, but some coefficients are no longer significant at 1%. The coefficient of QCFC remains negative and strongly significant at 1%, which reveals that Chinese listed SOEs are generally overinvested. Thus, Hypothesis 2b is proven.

To conduct a further investigation on the relation between SOE attribute and a firm's

investment behavior, the thesis continues the regression in two subgroups of SOEs. Model three is designed for local SOEs, and model four is designed for central SOEs. The results of model 3 are highly similar to those of model 2. Again, the coefficient of QCFK is significantly negative, indicating that local SOEs are generally overinvested. The results of model 4 are slightly different from those of models 2 and 3. First, none of the coefficients are significant except for Tobin's Q, which is positive at the 10% level. Second, the coefficient sign of cash amount (CA) becomes negative (from positive) in the previous three models. Third, although the coefficient of QCFK remains negative, it is not significant, with a t-statistics value of only -0.313. Based on the results of model 4, it cannot say that listed central SOEs are overinvested. Indeed, this output is similar to the finding obtained in the previous section on Hypothesis 2a, i.e., that local SOEs engage in more unexpected investment than central SOEs do. The finding for model three reveals that local SOEs are overinvested, but this study does not obtain the same finding for central SOEs. One possible explanation for this result is that local government engages in more intervention in local SOEs because of GDP competition and fiscal decentralization, which are discussed at the end of section 3.6.1.2. Another possible explanation is that there are only 675 observations in the sample set of central SOEs, a number that is insufficient for the cross-section OLS regression. This explanation can be tested in a future study that includes more firm-year observations.

3.6.3 Robustness test

3.6.3.1 Robustness test for Hypothesis 2a

As discussed in section 3.6.1.2, the R-squared values of regressions based on fixed effects panel data models are very low. The results indicate that the model may miss some important explanatory variable. Referring to Richardson (2006), this thesis adds one period lagged firm investment as an additional explanatory variable. To construct the model, according to Arellano and Bond (1991), Blundell and Bond (1998) and

Windmeijer (2005), the thesis introduces a two-step, bias-corrected system GMM (Generalized Method of Moments) estimator for a dynamic panel data model in determining firm's investment, as shown in equation 3-14 below.

$$\begin{aligned}
Inew_{i,t} = & \alpha + \beta_1 Inew_{i,t-1} + \beta_2 Lever_{i,t-1} + \beta_3 Cash_{i,t-1} \\
& + \beta_4 Companyage_{i,t} + \beta_5 Lnrev_{i,t-1} + \beta_6 Stockretrun_{i,t-1} \\
& + \beta_7 TobinQ_{i,t-1} + \beta_8 Year_i + \beta_9 Industry_i + \mu_i + \varepsilon_{i,t}
\end{aligned}
\tag{3-14}$$

Table 3.11 shows the results of regression based on above DPD-GMM model.

[Table 3.11]

This thesis then uses this regression to predict the firm's new investment (namely, $pInew$) to calculate free cash flow in equation 3-12 based on sys GMM panel data model. To test Hypothesis 2a, the thesis redoes equation 3-12 based on four panels. The results of the regressions are presented in Table 3.12

[Table 3.12]

The result of panel I supports the hypothesis 2a. All of the coefficients are significant, and the F value is 65.03, thus indicating that the regression is meaningful. Again, ownership concentration is negatively related to unexpected investment. Same as result based on fixed effects panel data model, a firm's business operational margin has a negative influence on the investment level. Consistant with the previous results, the coefficient of negative FCF is 0.0557 and the coefficient of positive FCF is 0.169, significantly¹⁵ different at the 1% level. Thus, the regression results in Table 3.12 show that again firms with positive free cash flow are more likely to over-invest on average. SOETAG is significantly and positively related to the firm's unexpected investment thus proving Hypothesis 2a once more.

Results in Panel II to Panel III are also same as previous outputs based on fixed

¹⁵To test heterogeneity of coefficients of FCFpositive and FCFnegative, the F-test is constructed.

H0: $\beta_1 = \beta_2$; H1: $\beta_1 \neq \beta_2$.

Testing Results: $t=68.19$, $p=0.000$. So the two coefficients are significantly different.

effects panel data model. Local SOEs engage in more unexpected investment than other firms, again the regression result of panel III reveals that central-SOE attribute has a positive—but not significant—relation to a firm’s unexpected investment. Both LOCALTAG and CENTRALSOE show a positive relation with firm’s unexpected investment with significance at 0.01 level in Panel IV.

In summary, the regression results based on system GMM dynamic panel data models are similar to the results shown in Table 3.8. SOE attribute is positively related to a firm’s unexpected investment at the 0.01 level, and local SOE companies engage in more unexpected investment than other companies. Moreover, central SOE attribute does not significantly influence a firm’s level of unexpected investment. Therefore, the research methods are robust.

3.6.3.2 Robustness test for Hypothesis 2b

The thesis substitutes a firm’s gross margin (profit) for its sales revenue (sales) as the proxy for firm operational performance in equation 3-13. The thesis also substitutes natural logarithm of firm’s total assets (lnsize) for size dummy in equation 3-13. Table 3.13 shows the results of the regressions based on a firm’s gross margin.

The results for the four models are presented in Table 3.13. The first model is conducted using the full samples, including both SOEs and non-SOEs. In the second model, the thesis runs the regression on the SOEs only. Models three and four report the results of regressions in local SOEs and central SOEs, respectively.

[Table 3.13]

The regression based on firm profit has results that are similar to those of model 3-13. For all companies—SOEs and local SOEs alike—QCFK is significantly and

negatively related to a firm's annual investment, which indicates that overinvestment occurs in all companies (i.e., SOEs and local SOEs). In addition, similar to the outputs of model 3-13, QCFK is not significant for central SOEs. The above results comply with the results of model 3-13, and thus, the regression model is robust.

3.7 Conclusion and Discussion

Firm investment behavior is a key research field in both corporate governance and corporate finance. In this chapter, the thesis examines the investment behavior of Chinese listed SOEs. Chinese SOEs are different from modern corporations both in their internal corporate governance and in their external financing conditions.

Because of compensation regulations and the absence of the State owner, as this thesis showed in Chapter 2, Chinese SOEs experience both serious agency problems and serious conflicts of interest. SOE managers have incentives to offset their compensation loss through overinvestment whenever there is adequate internal cash flow. However, Chinese SOEs enjoy advantages in external financing and investment conditions. The Chinese government offers SOEs large tax reductions and subsidies, and SOEs can obtain favorable bank loans because of financial repression (Shaw and Kinnon, 1973) and ownership discrimination in credit rationing. Simultaneously, China's SOEs have many more opportunities than ordinary private firms to go public because of China's approval and review system for initial public offerings (IPOs). For the above reasons, the thesis argues that listed Chinese companies suffer from severe investment inefficiencies, specifically, the overinvestment problem.

In this chapter, the thesis argues that SOE attribute is positively related firm's overinvestment in Chinese listed SOEs, and the thesis finds that Chinese listed SOEs are generally overinvested. This thesis begins the research by referring to the previous works of Richardson (2006), Vogt (1994), and Mei (2005).

This empirical study shows that SOE attribute has a significantly positive influence on a firm's unexpected investments. The results reveal that with other conditions controlled, SOEs will engage in more investment than non-SOEs. Furthermore, SOE attribute is associated with firm's engagement in more investment. The thesis then separates SOEs into local SOEs and central SOEs for further investigation. The regression results show that local SOEs invest more than other firms, but central SOE attribute does not have a significant relation to a firm's level of unexpected investments. The implication of the results is not only that SOE attribute causes firms to engage in more investment but also that a local SOE attribute instead of a central SOE attribute is the primary factor driving overinvestment by Chinese listed SOEs.

The thesis verifies the overinvestment situation of Chinese listed companies in the second part of this chapter, arguing that listed SOEs are generally overinvested. Firms experience both agency problems and financing constraints when making investment decisions. Agency problems normally cause a firm to overinvest, and financing constraints restrict a firm's disposable funds and cause underinvestment. This thesis checks the relation between a firm's annual investment and the interaction of its cash flow and Tobin's Q (**Cashflow**×**Q**). The empirical study shows a significantly negative relation between a firm's annual investment and **Cashflow**×**Q** among all listed firms, SOEs and local SOEs. The regression does not find a significant relation between the two factors among central SOEs. These results support the hypothesis that listed SOEs are generally overinvested. Furthermore, the result reveals that although local SOEs are overinvested, central SOEs may not be overinvested. Furthermore, local SOEs might be the primary factor that causes overinvestment by listed SOEs. This finding is consistent with outputs of the regression verifying Hypothesis 2a, in which the thesis finds that local SOE attribute instead of central SOE attribute, can result in positive unexpected investments by a firm. In summary, the empirical studies in this chapter support two hypotheses that SOE attribute causes more investment and that listed SOEs are generally overinvested.

3.8 Research Limitation and Discussion

Although the studies in this chapter are robust and can be mutually authenticated, there are several points that can be optimized or need further discussion.

The first point is that this thesis uses a firm's average Tobin's Q as the measure of its investment opportunity. However, only a firm's marginal Q can reflect firm performance and operational characteristics. Hayashi (1982) notes that one of the conditions under which average Q and marginal Q are equal is a fully effective capital market. Many studies report that Chinese stocks are only reaching (or is approaching) weak effectiveness (Wu, 1996; Lan et al., 2005). In such a situation, the stock price of listed Chinese firms only reflects a firm's historical information. Therefore, as an index of a firm's future investment opportunity based on stock price, average Q results in inevitable measurement errors. In future studies, margin Q should be the preferred choice, although it is very difficult to calculate.

The second point is that the thesis only sets yearly dummy variables in the models but do not consider either macroeconomic or fiscal policy changes during the period that my study covers. Future research should consider such changes to make the result more convincing.

In addition, in future studies, more and sufficient firm-year observations of central SOE samples should be collected to check the relation between a firm's annual new investment and the sensitivity between free cash flow and investment.

Figure 3.1 Impact of growth opportunities and financial conditions on firm investment Policy

		Growth opportunities	
		<i>High</i>	<i>Low</i>
Financial condition	<i>Positive</i>	Optimal investment policy	Managerial overinvestment
	<i>Negative</i>	Risk avoidance	Risk shifting and underinvestment (Myers)

Source: Brito and John (2001)

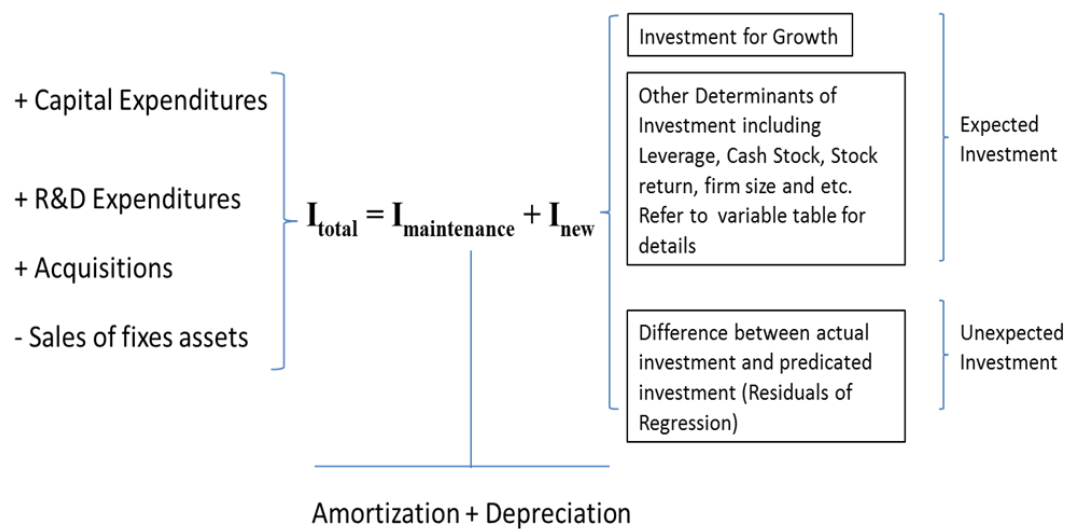
This figure summarizes the relationship between growth prospects, financial conditions, and investment choices.

Figure 3.2 Mechanisms for mitigating investment inefficiency

Causes of investment Inefficiency	Mechanisms of intervention
<i>Shareholder-manager conflicts</i>	<ol style="list-style-type: none"> 1 Debt overhang 2 Dividend payments 3 Share repurchase 4 Remuneration policy
<i>Risk shifting</i>	<ol style="list-style-type: none"> 5 Convertible bonds 6 Separate incorporation
<i>Pyramid ownership</i>	<ol style="list-style-type: none"> 7 Investor protection
<i>Asymmetric information</i>	<ol style="list-style-type: none"> 8 Increased financial market efficiency 9 Concentration of debt holders 10 Reputation-building
<i>Overconfidence</i>	<ol style="list-style-type: none"> 11 Intensive market competition

This figure presents a detailed illustration of each mechanism that corresponds to the various causes of investment inefficiency.

Figure 3.3 Illustration of firm investment measurement



This figure presents the structure of firm's total investment. This thesis separates the firm's total investment into two parts. The first part is the investment amount that maintains the firm's existing assets. The second part is the total investment in new projects (Strong and Meyer, 1990; Richardson, 2006).

Table 3.1 Variable definitions for regression to predict appropriate new investment level

Variable	Name	Definition
New Investment ² (Dependent Variable)	Inew	$I_{new} = I_{total} - I_{maintenance}$ $I_{total} = CAPEX + Acquisition + RND - Sale\ PPE$ $I_{maintenance} = Depreciation + Amortization$
Investment opportunities		
Average Tobin's Q	TobinQ	Tobin's Q = Market value/Book value
Company Age	companyage	Natural logarithm of years since firm's IPO
Financing Constraints		
Cash Stock ²	Wcash	Operational Net Cash Flow + Short-term Investment
Leverage (Debt rate)	Wlever	(Debt)/(Total assets)
Company Size	Inrev	Natural logarithm of firm's annual revenue
Stock Return	wstockreturn	(Total Market value/Prior Year's Total Market value)-1
Fixed effectss		
Industry Dummy ¹	DUMIND*	Refer to note below
Yearly Dummy	Accper	2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012

Note1:

A: Agriculture; B: Oil and Gas; C: Manufacturing; D: Power and Utilities; E: Construction; F: Wholesale and Retail; G: Transportation and Logistics; H: Lodging; I: Information Technology; K: Real Estate; L: Commercial Services; M: R&D and Technical Services; N: Water and Environment; O: Residential Services; P: Education; Q: Health; R: Culture, Sports, Entertainment; S: Conglomerate.

Note2: All of the investment expenditures mentioned in the regression are scaled by average total assets to eliminate unit dimensions.

This table presents details for the regression's dependent and independent variables to predict a firm's appropriate new investment level. The model considers three impacts to firm's invest level: Investment opportunities, Financing constraints and fixed effectss.

Table 3.2 Variable definitions for the regression to verify Hypothesis 2a

Variable	Name	Definition
Unexpected Investment (Dependent Variable)	Inewerr	$I_{newerr} = I_{new} - I_{new}^*$ Firm's actual new investment minus expected new investment, also equal to regression residuals
Free Cash Flow Dummy		
Positive FCF	FCFpositive	When $FCF > 0$, $FCFpositive = FCF$; $FCF < 0$,
Negative FCF	FCFnegative	$FCFnegative = 0$ When $FCF < 0$, $FCFpositive = FCF$; $FCF > 0$, $FCFnegative = 0$
State Owned Attribute Dummy		
SOE attribute	SOETAG	If firm is ultimately controlled by the state, $SOETAG = 1$, otherwise $SOETAG = 0$
Firm Features		
Ownership concentration	Blockholder	(Ownership of the largest shareholder)/(Ownership of top four largest shareholders)
Business operation margin	Grossm	(Gross profit)/(Operating revenue)

Note:

- $I_{new} = I_{total} - I_{maintenance}$ in which $I_{total} = CAPEX + Acquisition + RND - Sale\ PPE$; $I_{maintenance} = Depreciation + Amortization$
- $FCF = (CFO - I_{maintenance} + RND) - pI_{new}$
- If the regression coefficient of SOETAG is significant and positive, it means that SOE status is positively related to firm's overinvestment, and thus Hypothesis 2a is proven.
- Inewerr is scaled by firm's total assets.

This table presents the variables for the regression to verify hypothesis 2a, namely, Among Chinese publicly listed companies, SOE attribute drives the firm to invest more. Dependant variable is Unexpected Investment, labeled as Inewerr, which is scaled by firm's total assets.

This thesis separates the firm's total investment into two parts. The first part is the investment amount that maintains the firm's existing assets. The second part is the total investment in new projects. So $I_{new} = I_{total} - I_{maintenance}$ in which $I_{total} = CAPEX + Acquisition + RND - Sale\ PPE$; $I_{maintenance} = Depreciation + Amortization$. FCF denotes firm's free cash flow. FCF can be obtained as: $FCF = (CFO - I_{maintenance} + RND) - pI_{new}$, in which CFO is firm's operating cash flow. RND is cash for firm's research and development activities. pI_{new} is predicated firm new investment based on firm investment model described in table 3.1. If the regression coefficient of SOETAG is significant and positive, it means that SOE status is positively related to firm's overinvestment, and thus Hypothesis 2a will be proven.

Table 3.3 Variable definitions for the regression to verify Hypothesis 2b

Variable	Name	Definition
Annual Investment (Dependent Variable)	newinvest	$[(\text{Fixed assets})_t - (\text{Fixed assets})_{t-1}] / (\text{Total assets})_{t-1}$ Fixed asset=Net fixed assets+ project materials +ongoing projects
<i>Investment opportunity</i>		
Tobin's Q	TobinQ	Market value / Total book value
Cash Flow	CF	(Net operating cash flow – Dividend & interests – Taxation) / (Total assets) _{t-1}
Cash Amount	CA	(Cash+ Short-term investment) / (Total assets) _{t-1}
<i>Firm Features</i>		
Debt Rate	lever	(Debt)/(Total assets)
Annual Revenue	sales	(Annual sales revenue) / (Total assets) _{t-1}
Company Size Dummy	size	If sales revenue >400 million RMB, size=1 otherwise =0
<i>Interaction</i>		
(Cash Flow) × Tobin's Q	QCFK	(Cash flow) × Tobin's Q / (Total assets) _{t-1}
<i>Year Indicators</i>		
	i.Accper	Dummy variable
<i>Industry Indicators</i>		
	Dumind*	Dummy variable

This table presents variable definitions for the regression to verify hypothesis 2b, namely, in general Chinese listed SEOs engage in overinvestment. Refer to Vogt (1994) method the sign of the regression coefficient of the interaction variable (QCFK) indicates a firm's investment status. A positive sign indicates underinvestment, whereas a negative sign indicates overinvestment.

Note that variables with financial values, including Newinvest, CF, CA sales QCFK, are scaled by the firm's one-period lagged fixed assets on both sides of the equation to eliminate unit dimensions.

Company Size Dummy is based on the criteria of sales revenue. If sale revenue is bigger than 400 million RMB, the firm will be a large company, or it is a middle and small size enterprise. This criteria comes from the Definition of Small and Middle Size Firms in China (中小企业划型标准规定), issued by the Chinese Ministry of Industry and Information in 2011.

Table 3.4 Descriptive statistics for the variables in the regression to predicate firm's new investment (equation 3-11)

Variable	Obs	Mean	Std.Dev.	Min	Max
WInew	12214	0.0369881	0.0633495	-0.0959157	0.2547226
TobinQ	12262	2.380027	1.724699	0.786597	10.9623
Wlever	12263	0.4776212	0.2567108	0.045867	1.690677
Wcash	12263	0.0502551	0.0761732	-0.1743393	0.2644009
Companyage	12257	1.759775	1.147074	-5.899897	3.093282
Lnrev	12263	20.97578	1.554027	7.124728	28.65564
Wstockretrun	12263	0.4034784	1.112433	-0.7828947	5.435644

Note:

- a) wcash denotes firm's cash amount, it is defined as: Operational Net Cash Flow plus Short-term Investment
- b) wlever is firm's debt ratio, defined as: (Debt)/(Total assets)
- c) companyage is natural logarithm of years since firm's IPO.
- d) Lnrev is natural logarithm of firm's annual revenue.
- e) wstockretrun denotes firm's market value, defines as: (Total Market value/Prior Year's Total Market value)-1
- f) WInew is firm's new investment, defined as: $I_{new} = I_{total} - I_{maintenance}$

This table presents descriptive statistics for the variables in the regression to predicate firm's new investment, i.e., equation 3-11. To eliminate the influences of these singular values in the regression, this thesis winsores all of the variables (except for Companyage and Lnrev) at the 1% level.

Table 3.5 Variable correlation matrix for regression to predicate firm's new investment (equation 3-11)

(obs=12207)	WInew	wstockretrun	TobinQ	wlever	Wcash	Companyage	lnrev
WInew	1						
wstockretrun	-0.0285	1					
TobinQ	-0.0390	0.3687	1				
wlever	-0.1778	0.0229	-0.0778	1			
Wcash	0.0806	0.0837	0.0619	-0.1092	1		
Companyage	-0.2499	-0.0398	-0.1223	0.3968	0.0648	1	
lnrev	0.0972	0.0260	-0.3771	0.1498	0.1620	0.1805	1

Note:

- a) wcash denotes firm's cash amount, it is defined as: Operational Net Cash Flow plus Short-term Investment
- b) wlever is firm's debt ratio, defined as: (Debt)/(Total assets)
- c) companyage is natural logarithm of years since firm's IPO.
- d) lnrev is natural logarithm of firm's annual revenue.
- e) wstockretrun denotes firm's market value, defines as: (Total Market value/Prior Year's Total Market value)-1
- f) WInew is firm's new investment, defined as: $I_{new}=I_{total}-I_{maintenance}$

This table presents the correlations among the variables in regression to predicate firm's new investment, namely equation 3-11. The maximum correlation is -0.3771 between lnrev and TobinQ, and other absolute values of the correlations are generally lower than 0.35, thus indicating that multicollinearity is not significant.

Table 3.6 Results of regression to predict firm investment level (equation 3-11)

VARIABLES	Predicted Sign	Panel under FE			
		I	II	III	IV
TobinQ _{t-1}	+	0.00469*** (10.93)			0.00461*** (7.448)
wlever _{t-1}	-			-0.0675*** (-13.51)	-0.0678*** (-13.62)
Wcash _{t-1}	+			0.0172* (1.946)	0.0211** (2.367)
Companyage	-			-0.00921*** (-4.373)	-0.0247*** (-7.620)
Lnrev _{t-1}	+			0.00140 (1.167)	
wstockretrun _{t-1}	+			0.00291*** (6.435)	0.00134* (1.823)
Lnsize _{t-1}	+				0.00432** (2.531)
Constant		0.0243*** (20.93)	0.0424*** (27.44)	0.0554** (2.340)	0.00724 (0.199)
Year Indicators		No	Yes	No	Yes
Observations		9,917	12,214	9,917	9,917
R-squared		0.015	0.009	0.036	0.051
F Value		119.54	13.52	58.89	35.85

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- wcash denotes firm's cash amount, it is defined as: Operational Net Cash Flow plus Short-term Investment
- wlever is firm's debt ratio, defined as: (Debt)/(Total assets)
- companyage is natural logarithm of years since firm's IPO.
- lnrev is natural logarithm of firm's annual revenue.
- wstockretrun denotes firm's market value, defines as: (Total Market value/Prior Year's Total Market value)-1
- lnsize is natural logarithm of firm's year end total assets.

This table presents the results of the regression that predict a firm's investment level. The regression's residuals will indicate a firm's over- or underinvestment. The table reports four models under fixed effects estimator. In the first model, the thesis only considered the firm's investment opportunities, which are measured by Tobin's Q. The table presents the influence of industry dummy variables and year dummy variables in model II. Model III reports other variables (except for Tobin's Q) that influence a firm's investment decisions. Model IV includes all of the variables from model I to model III, and thus, the explanatory power increases to 5.1%.

Table 3.7 Descriptive statistics of the variables in regression to check relation between overinvestment and SOE attribute (equation 3-12)

Variable	Obs	Mean	Std. Dev.	Min	Max
Inewerr	9897	-1.36E-18	0.0510989	-0.1848675	0.2918235
FCFpositive	9897	0.0243858	0.0493844	0	1.024537
FCFnegative	9897	-0.0310753	0.0742954	-4.93934	0
soetag	9897	0.5147191	0.5000034	0	1
localtag	9897	0.4326567	0.4998037	0	1
centralsoe	9897	0.062968	0.2429163	0	1
blockholder	9897	0.6402853	0.20023668	0.1114677	1
grossm	9897	0.248837	0.1779676	-1.812309	1

Note:

- a) Inewerr denotes firm's unexpected investment which can be obtained from the regression residues described in table 3.6.
- b) FCFpositive and FCFnegative denote firm's positive and negative free cash flow respectively.
- c) Soetag is dummy variable of SOEs.
- d) localtag is dummy variable of local SOEs.
- e) centralsoe is dummy variable of central SOEs.
- f) blockholder denotes firm's ownership concentration, which can be calculated as Ownership of the largest shareholder divided by Ownership of top four largest shareholders.
- g) grossm is business operation margin, can be obtained as: (Gross profit)/(Operating revenue)

This table presents Descriptive statistics of the variables in regression to check relation between overinvestment and SOE attribute which is described in equation 3-12.

Table 3.8 Regression results to test Hypothesis 2a-the relation between firm's overinvestment and SOE attribute

Variables	Panel			
	I All SOEs	II Local SOEs	III Central SOEs	IV Local and Central SOEs
FCFpositive	0.0758*** (6.028)	0.0751*** (5.972)	0.0751*** (5.960)	0.0756*** (6.015)
FCFnegative	0.0691*** (9.059)	0.0703*** (9.224)	0.0746*** (9.809)	0.0692*** (9.061)
soetag	0.00809*** (6.395)			
blockholder	-0.0157*** (-5.035)	-0.0147*** (-4.761)	-0.0107*** (-3.556)	-0.0157*** (-5.038)
grossm	-0.00621* (-1.784)	-0.00714** (-2.057)	-0.00824** (-2.369)	-0.00636* (-1.826)
localtag		0.00747*** (5.976)		0.00839*** (6.433)
centralsoe			0.00151 (0.635)	0.00608** (2.461)
Year Effect	Yes	Yes	Yes	Yes
Industry Effect	Yes	Yes	Yes	Yes
Constant	0.00702** (2.437)	0.00751*** (2.615)	0.00972*** (3.404)	0.00700** (2.432)
Observations	9,897	9,897	9,897	9,897
Adjusted R-squared	0.0226	0.0218	0.0183	0.0226
F Value	50.96	50.28	44.06	42.64

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- FCFpositive and FCFnegative denote firm's positive and negative free cash flow respectively.
- Soetag is dummy variable of SOEs.
- localtag is dummy variable of local SOEs.
- centralsoe is dummy variable of central SOEs.
- blockholder denotes firm's ownership concentration, which can be calculated as Ownership of the largest shareholder divided by Ownership of top four largest shareholders.
- grossm is business operation margin, can be obtained as: (Gross profit)/(Operating revenue)

This table presents regression results to test the relation between firm's over investment and SOE attribute. The table reports results of four panels. The first panel checks the relation between a firm's unexpected investment and the SOE attribute dummy variable in all of the samples. In the second and third panel, the thesis substitutes SOE attribute with local SOE attribute and central SOE attribute, respectively. In the fourth panel, the thesis puts both CENTRALSOE and LOCALTAG into the regression. Note that both CENTRALSOE and LOCALTAG comprise the subset of SOETAG.

Table 3.9 Descriptive statistics of the variables for regression to verify hypothesis 2b (equation 3-13)

Variable	Obs	Mean	Std.Dev.	Min	Max
newinvest	9897	.0687221	.3274577	-.4808693	7.02214
TobinQ	9897	2.484	1.763	0.8015	11.352
lever	9897	0.519	1.399	0.00708	96.959
CF	9897	-1.890752	8.975367	-107.5083	10.6366
sales	9897	.7396158	.5927821	.0005669	10.0152
QCFK	9897	-10.26381	197.9393	-16468.94	196.816
CA	9897	0.466	1.155	-0.783	5.605
size	9897	.8703366	.3359498	0	1

Note:

- a) newinvest denotes firm's annual investment, it is defined as: $[(\text{Fixed assets})_t - (\text{Fixed assets})_{t-1}] / (\text{Total assets})_{t-1}$.
- b) lever is firm's debt ratio, defined as: $(\text{Debt}) / (\text{Total assets})$
- c) CF is firm's cash flow.
- d) sales denotes firm's sales revenue.
- e) QCFK denotes the interaction of Tobin's Q and cash flow. It is defined as: $(\text{Cash flow}) \times \text{Tobin's Q} / (\text{Total assets})_{t-1}$
- f) CA denotes firm's cash amount
- g) size is company size dummy variable. Namely, If sales revenue >400 million RMB, size=1 otherwise =0.

This table presents descriptive statistics of the variables for regression to verify hypothesis 2b which is described in equation 3-13. The table shows the descriptive statistics after the Winsor operation at 0.1% level to newinvest, CF, CA, TobinQ, and lever.

Table 3.10 Results of the regression to check overinvestment status among SOEs

VARIABLES	Models			
	I All Companies	II SOE	III Local SOE	IV Central SOE
TobinQ _{t-1}	0.0252*** (11.00)	0.0135*** (3.944)	0.0128*** (3.513)	0.0264* (1.650)
lever _{t-1}	-0.00519** (-2.030)	-0.0147 (-0.829)	-0.0115 (-0.618)	-0.0602 (-0.622)
CF	0.0122*** (3.281)	0.00526 (0.520)	0.00630 (0.612)	-0.178 (-0.874)
sales	0.000649 (0.101)	0.000432 (0.0536)	-0.000394 (-0.0467)	0.0272 (0.582)
QCFK	-0.000353*** (-18.94)	-0.000909*** (-4.131)	-0.000880*** (-3.928)	-0.000877 (-0.313)
CA	0.00656*** (2.679)	0.00179 (0.274)	0.00269 (0.404)	-0.119 (-0.909)
size	0.0977*** (8.087)	0.100*** (5.006)	0.104*** (4.937)	0.0502 (0.556)
Industry Indicator	Yes	Yes	Yes	Yes
Year Indicator	Yes	Yes	Yes	Yes
Constant	-0.0610*** (-3.451)	-0.0325 (-1.198)	-0.0352 (-1.225)	-0.00315 (-0.0255)
Observations	9,894	5,297	4,622	675
Adjusted R ²	0.0722	0.0264	0.0235	0.0368
F Value	43.88	8.19	6.55	1.98

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- TobinQ is Market Valus/Total assets
- lever is firm's debt ratio, defined as: (Debt)/(Total assets)
- CF is firm's cash flow.
- sales denotes firm's sales revenue.
- QCFK denotes the interaction of Tobin'Q and cash flow. It is defined as: (Cash flow) × Tobin's Q /(Total assets)_{t-1}
- CA denotes firm's cash amount
- size is company size dummy variable. Namely, If sales revenue >400 million RMB, size=1 otherwise =0.

This table presents results of the regression to check overinvestment status among SOEs which is described in equation 3-13. The results for the four models are presented in this Table. The first model is conducted using the full samples, including both SOEs and non-SOEs. In the second model, the thesis runs the regression on the SOEs only. Models three and four report the results of regressions in local SOEs and central SOEs, respectively.

Table 3.11 Firm Unexpected investment: FE vs SYS GMM Estimator

VARIABLES	Panel I	Panel II
	Fixed effects Panel Data	DPD-System GMM
WInew _{t-1}		0.390*** (23.49)
TobinQ _{t-1}	0.00457*** (7.427)	0.00207* (1.929)
Insize _{t-1}	0.00433** (2.548)	-0.0276** (-2.521)
wstockretrun _{t-1}	0.00136* (1.856)	0.000215 (0.0952)
wlever _{t-1}	-0.0676*** (-13.67)	-0.0762** (-2.304)
Wcash _{t-1}	0.0200** (2.467)	-0.0881** (-2.126)
companyage	-0.0249*** (-7.697)	-0.0159*** (-7.387)
Industry Effect	No	Yes
Year Effect	Yes	Yes
Constant	0.00746 (0.206)	-0.148*** (-3.652)
Arellano-Bond Test (3 order autocorrelation. p-value)		0.1656
Sargan Test (p-value)		0.0588
Observations	9,910	9,910
R-squared	0.052	
Number of Firm	1,944	1,944

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- a) wcash denotes firm's cash amount, it is defined as: Operational Net Cash Flow plus Short-term Investment
- b) wlever is firm's debt ratio, defined as: (Debt)/(Total assets)
- c) companyage is natural logarithm of years since firm's IPO.
- e) wstockretrun denotes firm's market value, defines as: (Total Market value/Prior Year's Total Market value)-1
- f) Insize is natural logarithm of firm's year end total assets.
- g) WInew is firm's yearly new investment

This table presents the comparison between fixed-effects panel data model and the dynamic panel data model in determining firm's yearly new investment. Estimates in column 1 were obtained using the fixed effects estimator. Estimates in column 2 were obtained using the system GMM estimator. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. The dependent variable is Inew, the difference between firm total

investment and investment to maintain existing assets (namely, $I_{\text{new}} = I_{\text{total}} - I_{\text{maintenance}}$, see table 3.1 for details.). For the system GMM regression, m3 is a test for third-order serial correlation of the differenced residuals, asymptotically distributed as $N(0,1)$ under the null of no serial correlation. The Sargan test of over-identifying restrictions is distributed as Chi-square under the null of instrument validity. We treat TobinQ_{t-1} , lnsize_{t-1} , $\text{wstockretrun}_{t-1}$, wlever_{t-1} , and wcash_{t-1} as potentially endogenous variables. Levels of these variables dated t-2 and further are used as instruments in the first-differenced equations and first-differences of these same variables lagged twice are used as additional instruments in the level equations.

Table 3.12 Robustness test for Hypothesis 2a under Sys GMM Estimator

Variables	Panel			
	I All SOEs	II Local SOEs	III Central SOEs	IV Local and Central SOEs
FCFpositive	0.169*** (16.42)	0.168*** (16.38)	0.168*** (16.39)	0.168*** (16.41)
FCFnegative	0.0557*** (8.174)	0.0565*** (8.300)	0.0588*** (8.647)	0.0557*** (8.176)
soetag	0.00571*** (4.994)			
blockholder	-0.0108*** (-3.825)	-0.0100*** (-3.583)	-0.00733*** (-2.679)	-0.0108*** (-3.826)
grossm	0.0361*** (11.25)	0.0354*** (11.07)	0.0346*** (10.82)	0.0360*** (11.22)
localtag		0.00513*** (4.541)		0.00585*** (4.963)
centralsoe			0.00159 (0.741)	0.00477** (2.134)
Year Effect	Yes	Yes	Yes	Yes
Industry Effect	Yes	Yes	Yes	Yes
Constant	-0.00893*** (-3.415)	-0.00853*** (-3.271)	-0.00705*** (-2.722)	-0.00893*** (-3.417)
Observations	9,897	9,897	9,897	9,897
Adjusted R-squared	0.068	0.067	0.065	0.068
F Value	65.03	64.61	62.66	59.62

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

a) FCFpositive and FCFnegative denote firm's positive and negative free cash flow respectively.

b) Soetag is dummy variable of SOEs.

c) localtag is dummy variable of local SOEs.

d) centralsoe is dummy variable of central SOEs.

e) blockholder denotes firm's ownership concentration, which can be calculated as Ownership of the largest shareholder divided by Ownership of top four largest shareholders.

f) grossm is business operation margin, can be obtained as: (Gross profit)/(Operating revenue)

This table presents regression results to test the relation between firm's over investment and SOE attribute. The table reports results of four panels. The first panel checks the relation between a firm's unexpected investment and the SOE attribute dummy variable in all of the samples. In the second and third panel, the thesis substitutes SOE attribute with local SOE attribute and central SOE attribute, respectively. In the fourth panel, the thesis puts both CENTRALSOE and LOCALTAG into the regression. Note that both CENTRALSOE and LOCALTAG comprise the subset of SOETAG.

Table 3.12 Robustness test for Hypothesis 2b

VARIABLES	Models			
	I	II	III	IV
	All Companies	SOE	Local SOE	Central SOE
TobinQ _{t-1}	0.0350*** (16.64)	0.0252*** (7.822)	0.0252*** (7.444)	0.0369** (2.333)
lever _{t-1}	-0.00661*** (-3.080)	-0.0530*** (-3.971)	-0.0472*** (-3.469)	-0.146 (-1.628)
CF	0.0176*** (5.757)	0.0340*** (4.208)	0.0345*** (4.265)	0.130 (0.708)
profit	-0.137*** (-4.618)	-0.0949** (-2.328)	-0.117*** (-2.763)	-0.0740 (-0.335)
QCFK	-0.000239*** (-15.60)	-0.000597*** (-3.330)	-0.000589*** (-3.291)	-0.000147 (-0.0623)
CA	0.0112*** (5.591)	0.0221*** (4.217)	0.0226*** (4.297)	0.0842 (0.709)
lnsize	0.0604*** (21.53)	0.0589*** (16.12)	0.0621*** (15.37)	0.0618*** (4.561)
Industry Indicator	Yes	Yes	Yes	Yes
Year Indicator	Yes	Yes	Yes	Yes
Constant	-1.286*** (-20.63)	-1.226*** (-15.02)	-1.298*** (-14.42)	-1.263*** (-3.992)
Observations	9,894	5,297	4,622	675
Adjusted R ²	0.096	0.076	0.075	0.120
F Value	62.32	24.27	20.85	3.46

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- TobinQ is Market Valus/Total assets.
- lever is firm's debt ratio, defined as: (Debt)/(Total assets)
- CF is firm's cash flow.
- profit denotes firm's sales gross margin, scaled by firm's total asste.
- QCFK denotes the interaction of Tobin'Q and cash flow. It is defined as: (Cash flow) × Tobin's Q /(Total assets)_{t-1}
- CA denotes firm's cash amount
- lnsize is natural logarithm of firm's year end total assets.

This table presents results of robustness test for Hypothesis 2b. The thesis substitutes a firm's gross margin (profit) for its sales revenue (sales) as the proxy for firm operational performance in equation 3-13. Table 3.12 shows the results of the regressions based on a firm's gross margin. The results for the four models are presented in this Table. The first model is conducted using the full samples, including both SOEs and non-SOEs. In the second model, the thesis runs the regression on the SOEs only. Models three and four report the results of regressions in local SOEs and central SOEs, respectively. The above results comply with the results of model 3-13, shown in Table 3.10, and thus, the regression model is robust.

Chapter 4. The Relationship between Executive Compensation and Investment Behavior in Chinese Listed Companies

4.1 Abstract

This chapter examines the relation between compensation regulation and a firm's investment inefficiency. The thesis finds a significant and positive relation between the extent of compensation regulation and the degree of a listed SOE's overinvestment. For those SOEs that are not overinvested, the thesis finds that compensation regulation will increase firm investment. These findings reveal that compensation regulation will cause agency problems in SOEs. This thesis finds that both local and central SOEs have a similar relation between compensation regulation and firm investment behavior.

4.2 Introduction

4.2.1 Background and rationale

This thesis has investigated executive compensation in Chapter 2 and firms' investment situations in Chapter 3. The research finds that executive compensation in Chinese listed companies is significantly below the market-determined level. Simultaneously, the thesis demonstrates that a firm's SOE attribute is positively related to firm's overinvestment and that, in general, listed SOEs are overinvested.

In this chapter, the thesis attempts to investigate the possible relation between executive compensation regulation and firm investment behavior in listed SOEs.

Because of executive compensation regulation in Chinese SOEs, executive compensation of SOE managers is below the market level. Moreover, SOE executives normally either do not have equity incentives or have only very weak equity-based

incentives that cannot offset the gap between their actual compensation and the executive compensation levels of private companies (Wang and Tang, 2014). Underpayment of executive compensation causes serious agency problems in Chinese listed SOEs. According to classic agency theory, agency issues appear when the interests of a firm's managers are not in line with those of the firm's owners, and thus, the managers will adopt a preference for on-the-job perks, shirking, or making self-interested and entrenched decisions that reduce shareholder wealth (Jensen and Meckling, 1976). It is understandable that because executives of SOEs are underpaid, they will find other ways to offset their losses, thus causing agency problems.

Gomez-Mejia and Wiseman (1997) argue that agents behave to maximize their own interests, and the interests of agents are normally not in line with the interests of principals.

Conversely, asymmetric information between principals and agents in Chinese SOEs aggravates agency problems. Absentee ownership is a prominent problem suffered by Chinese SOEs. Legally, the state is an SOE's owner. In practice, however, departments of central government and local governments are entrusted as supervisors to manage SOEs. Currently, the supervisors are SASACs in various levels of government. The problem is that these SASACs are not the true owners, and therefore, their officials do not have adequate incentives to supervise SOE management. In this situation, the managers who perform the day-to-day management of SOEs possess much more information than the government does. This inside information enables SOE executives to make managerial decisions that serve their own interests. Overinvestment is a common choice that enables SOE executives to realize their own interests. On the one hand, executives can obtain additional benefits from investment projects. On the other hand, overinvestment normally increases firm size, which will provide executives with more power and higher compensation because firm size is the one of most important determinants of executive compensation (Robert, 1956; Ciscel and Carroll, 1980; Tosi et al., 2000).

SOE investment inefficiency that arises out of conflicts of interest and asymmetric information cannot be thoroughly resolved under the current system. Therefore, I investigate whether the regulation of SOE executive compensation will result in overinvestment by listed SOEs.

In the remainder of this chapter, the thesis investigates the relation between executive compensation regulation and overinvestment in Chinese listed SOEs.

4.2.2 Research purpose

The goal of this chapter is to investigate the relation between executive regulation and overinvestment in Chinese listed companies. This study checks the correlation between the degree of executive compensation regulation and the degree of a firm's overinvestment.

Specifically, this chapter performs the following tasks:

- It investigates the relation between compensation regulation and a firm's unexpected investment in all of the sampled companies;
- It investigates the relation between compensation regulation and a firm's unexpected investment in all of the companies with positive unexpected investment; and
- It investigates the relation between compensation regulation and a firm's unexpected investment in all SOEs.

4.2.3 Key findings

In this section, the thesis finds a significant and positive relation between the extent of compensation regulation and the degree of a listed SOE's overinvestment. For those SOEs that do not overinvest, this thesis finds that compensation regulation increases a firm's investment. These findings reveal that compensation regulation causes agency

problems in SOEs. The thesis finds that both local and central SOEs show a similar relation between compensation regulation and firm investment behavior. The evidence reported in this section supports the argument that the regulation of executive compensation causes listed SOEs to overinvest.

4.3 Literature Review

Although there is a rich body of research that relates agency problems to corporate investment, very few of these studies focus on the relation between executive compensation and firms' investment behaviors both in China (Shi et al., 2013) and worldwide (Ryan and Wiggins, 2002).

Some scholars study how executive compensation structure influences firms' investment decisions. Gaver and Gaver (1995) show that executives' long-term incentive compensation is a larger portion of their total compensation at growth firms, whereas their fixed salary is a larger portion of their total compensation at non-growth firms. Kang et al. (2006) investigate the role of executive compensation structure on a firm's investment behavior. They argue that equity-based executive compensation is a key determinant of a firm's long-term investments in American corporations based on the finding that a firm's long-term investments increase with the increased weight of CEO equity-based compensation after controlling for financing constraints and Tobin's Q. Eisdorfer et al. (2013) obtain the similar finding that managers who receive more debt-based compensation (as a share of total compensation) tend to underinvest, whereas managers who receive more equity-based compensation are more likely to engage in overinvestment. Ryan and Wiggins (2002) argue that compensation structure and R&D are endogenous with each other. On the one hand, a firm's growth opportunities are positively related to the use of stock options in its compensation structure. On the other hand, stock options and restricted stock have a positive influence on a firm's R&D investment. Livne et al. (2013) examine the banking industry, documenting a positive relation between a firm's short-term investment and

CEO cash bonuses and reporting that banks with short-term investments pay higher cash bonuses to their executives than banks with long-term investments; in general, the former group of banks experience higher risk and worse performance.

Some other authors investigate executive compensation and firm investment spending from an agency problem perspective. Chakraborty et al. (1999) investigate uncertain CEO compensation and firms' investment decisions. These authors demonstrate that the more uncertain compensation received by the CEO, the fewer investments a firm will make; however, permanent earnings uncertainty has a greater impact than temporary earnings uncertainty on a firm's investments. This negative relation between uncertain CEO compensation and firm capital investment implies that agency costs influence a firm's investment decisions. Chen (2004) studies the relation between R&D expenditure and CEO compensation at Forbes 500 firms. Chen argues that changes in R&D spending are strongly and positively related to changes in CEO compensation when the CEO approaches retirement—namely, either horizon problems or so-called myopia problems in which the firm faces a small earnings decline or loss. The results of this empirical study support the author's argument and reveal that neither horizon problems nor myopia problems are associated with reduced R&D spending. This study also indicates that the level of association between changes in CEO compensation and R&D spending provides an effective way to mitigate agency problems related to reducing R&D expenditures to increase short-term financial performance. Mauer and Ott (2000) argue that because of agency problems, managers will maximize the value of their own compensation packages rather than their firms' equity value. Kanagaretnam and Sarkar (2011) extend that study and report that a compensation contract consisting of a fixed salary and equity-based compensation will mitigate underinvestment problems. The extent of that mitigation relies on the proportion of fixed salary and equity-based compensation.

Several studies have been published on the relation between executive compensation and firm investment behavior in the Chinese context.

Luo et al. (2008) argue that as a type of long-term incentive, equity-based compensation can influence executives' investment decisions. Conversely, investment will influence a firm's performance and therefore impact executive compensation levels. This empirical study shows that executive compensation and firm investment are endogenous when determined together. In Chinese listed companies, equity-based compensation has a positive impact on a firm's investment, which also has a positive relation with equity-based incentives for executives. Xia and Yu (2012) study Chinese listed firms from 2004 to 2010 based on panel data and the GMM method. They document that both cash compensation and equity-based compensation for executives interact with a firm's investment behaviors. Such relations are different in firms with different ownership; the authors show that private Chinese listed firms have better corporate governance mechanisms than SOEs, whereas SOE executives either do not have stock or have only a very small amount of stock. Meanwhile, compared to executives in non-SOEs, executives in SOEs care a great deal about being promoted in the political administrative ranks. Xu and Liu (2014) study incentive-based executive compensation and firms' investment behavior from an endogeneity perspective based on a simultaneous equation model. These authors report that a firm's investment behavior influences its accounting performance and then impacts executive compensation; investment intensity is negatively related to executive compensation, and therefore, the executive compensation mechanism suppresses the intensity of a firm's investment. Equity-based compensation will increase firm investment, and compensation performance sensitivity is not related to firm investment. This study is consistent with previous literature reporting that compensation and investment are endogenous. Conversely, this study implies that compensation regulations in SOEs mitigate incentives to SOE executives.

One important study on the relation between executive compensation and firm investment is conducted by Xin et al. (2007). Similar to the method in this thesis, the authors first build a compensation model based on those used by Chinese listed private firms, from which they calculate the gap between predicted and actual

compensation levels. The authors then calculate the extension of a firm's under- or overinvestment and then check the relation between the compensation gap and the extension of a firm's overinvestment. Xin et al. report that local SOEs are overinvested because compensation incentives for management have failed. This study is important because its research method avoids the endogeneity problem of previous studies and reveals a positive and significant relation between the compensation gap and a firm's overinvestment. However, that thesis has several points that require improvement. First, it uses data from 2000 to 2004, the period before China's 2005 split-share reform (Zheng et al., 2007), which significantly influences the corporate governance (Wang et al., 2010) of listed Chinese firms. Therefore, the thesis's findings are questionable because of the existence of abnormal, non-tradable ownership and its strong influence on both executive compensation and firms' investment decisions. Furthermore, SASAC (State-owned Assets Supervision and Administration Commission of the State Council) was established in March of 2003 during the first session of the tenth people's congress of People's Republic of China¹⁶. Before SASAC was established in 2003, all Chinese SOEs were managed by local governments or various ministries of central government. After March of 2003, all SOEs were managed and supervised by central SASAC and its local affiliates in each province according to previous administration and company size. The change is fundamental to SOEs, personnel management, financial management and overall corporate governance structure of Chinese SOEs have been significantly reformed since early 2003. No doubt, executive compensation and firm's investment decision of Chinese SOEs were also largely changed before and after 2003. However Xin et. al do not consider such changes in their thesis which causes standpoints of their research weak and inconvincible. Second, to construct an executive compensation model, the authors use a cross-section regression. However, executive compensation is inertial, which means that current compensation is closely related to compensation levels in previous periods; in other words, the compensation levels of previous periods strongly

¹⁶ http://news.xinhuanet.com/zhengfu/2003-03/06/content_761870.htm

influence current compensation. A simple cross-section regression cannot reflect all of the useful information that determines executive compensation levels. According to the studies by Arellano and Bond (1991) and Windmeijer (2005), using a GMM (Generalized Method of Moments) estimator for a dynamic panel data model to utilize more information contained in the samples for estimation is preferred. Thus in this research, a two-step, bias-corrected GMM estimation is introduced to obtain a better statistical inference. Third, the authors build a compensation model based on all private firms while omitting all SOEs. They argue that because private firms do not have compensation regulations, their executives receive compensation that is determined by the market. Although this argument sounds reasonable, in real human resources practices, both private firms and SOEs recruit managers. Therefore, even private firms will set their executive compensation, at least to some extent, using SOEs (which are normally leading companies in the industry) as a reference. In this sense, both SOEs and private firms determine the market level of an executive's compensation. If a study exempts SOEs and uses purely private firms as a proxy for the entire market, it is possible that compensation regulation is exaggerated, and therefore, a conclusion based on that distorted data is questionable. Finally, Xin et. al use total compensation of three managers with highest income in the company as the compensation index in their research. However, this methodology is explicitly questionable. Normally in a company, the managers on higher level have more power to make investment decisions. But, it is not necessarily to infer that higher level managers always have higher compensation. In China, many listed companies belong to different conglomerates. The chairman or general manager of a listed company also take responsibility in the conglomerate and receive their majority compensation from listed company's mother company. So the lower managers in a listed company may have higher compensation than does a chairman or a general manager. If merely to use top 3 salaries as the compensation proxy in the research, it may cause bias to only include lower level managers but miss chairmen or general managers who are more powerful when make investment decisions. A better sampling method to overcome such a bias is to use the total compensation of all managers disclosed by company's

annual reports, same method as described in chapter two of this paper.

Shi et al. (2013) investigate the influence of executive compensation on a firm's external investments, including both equity and debt investments. The authors report a non-linear, reversed "U" shape relation between the two. In addition, the study reveals that executive compensation decreases with the growth of a firm's total external investment.

Bu and Wen (2013) attempt to answer the question of whether the stickiness of executive compensation increases a firm's investment. According to those authors' research, the stickiness of executive compensation is defined as the gap between increases in executive compensation when firm performance is improving and decreases in executive compensation when firm performance is declining. Bu and Wen report that the greater the stickiness of executive compensation is, the greater the reward a firm will offer to executives and the greater the risk taking of the executive, which lead to a larger investment from the firm. This phenomenon is much more severe in privately held firms and local SOEs than in central SOEs; the authors argue that this finding also implies that central SOEs' regulation of executive compensation and investment amounts since 2004 has an impact on central SOEs.

Chen and Sun (2014) study the correlation between executive compensation and a firm's total investment among Chinese listed firms. The authors document that executive compensation is positively related to firm investment in all Chinese listed firms but that in listed SOEs, the correlation is insignificant. They argue that in Chinese firms, executive compensation influences firm investment and that executives who receive higher compensation will have more power to influence investment decisions. The authors further explain that executive compensation in Chinese SOEs is constrained by the existing system, and therefore, SOE executives are not motivated to make investment decisions that are in the interest of the firm. Although their study provides some useful information about the relation between executive compensation

and Chinese firms' investment behavior, its research methodology and conclusion are questionable. On the one hand, to investigate how executive compensation influences a firm's investment behavior, the authors merely run a regression between a firm's annual total investment and the total compensation of the firm's top 3 executives, together with some other variables such as Tobin's Q and financial leverage. However, this method is questionable because a firm's total investment and executive compensation are endogenous with each other (Ryan and Wiggins, 2002; Luo et al., 2008). Direct regression of the two variables causes an endogeneity problem and creates a biased result. On the other hand, the authors only use data from three years, with only 780 firm-year observations for SOE samples. Because a firm's investment is inertial, it is doubtful that three years are sufficient for a good investigation of the relation between executive compensation and firm investment. In addition, the relatively smaller size of the SOE sample set is most likely why the correlation between a firm's total investment and its executive compensation is insignificant in that study. In contrast, this paper's argument is that there is regulation of executive compensation in Chinese SOEs and that such regulation causes SOE executives to obtain less compensation than their peers in non-SOEs; therefore, SOE executives are motivated to overinvest to compensate for their income loss caused by the compensation regulations of the SOEs that they serve.

Based on a gambling theory framework, Zhang and Zhu (2014) present a theoretical perspective on overinvestment and compensation reform in Chinese SOEs. They argue that among the possible choices based on gambling between executives and the board of directors, whenever the board engages in monitoring, executives' optimal strategy is to overinvest. Based on the utility-function model, the authors prove that if the firm has no financing constraints, the proportion of performance-based compensation has a positive relation to the size of the firm's overinvestment and a negative relation to the return rate claimed by outside investors. This argument means that for Chinese SOEs that normally do not have financing constraints, executives' pursuit of compensation will—to some extent—lead to overinvestment. The authors

also give three suggestions about how to mitigate SOE overinvestment. First, SOEs should increase the proportion of innovation-related compensation in their executive compensation structures. Second, the government needs to introduce outside and private investors to SOEs and allow market competition to monitor SOE management. Third, the convenient financing between SOEs and state-owned banks should be gradually eliminated so that debt-financing issues can suppress overinvestment. Although Zhang and Zhu's research does not provide a specific quantitative model to measure the relation between executive compensation and firm investment, it is very significant in that it reveals the basic connection between these two key components of corporate governance and operations. Their research also provided this paper with good suggestions to further investigate the correlation between executive compensation and overinvestment using methods that are more quantitative.

In summary, the studies on executive compensation and firm investment behavior are not abundant. The existing studies do not support each other in a systemic way. Simultaneously, although several studies present useful information and show good progress in this field, the research methods and data used by previous studies still need to be checked and optimized.

4.4 Hypothesis Development

Listed Chinese firms, especially SOEs, experience many corporate governance challenges that are different from those experienced by firms in developed economies. Executive compensation in Chinese SOEs has several features. First, the major portion of executive compensation in Chinese SOEs is cash-based. Very few SOEs adopt equity-based compensation, and in those firms, the incentive effect of such compensation is very weak. Second, with respect to compensation and performance sensitivity, SOEs care more about executive compensation and their accounting performance (e.g., ROA and ROE), whereas private firms generally focus on the relation between executive compensation and stock price (Firth et al., 2006). Third, the compensation of SOE executives is generally lower than in private firms because

of compensation regulations in SOEs (Chen et al., 2006). In Chapter 2 of this thesis, the existence of such regulations in SOEs is proved.

There are two schools of thought about the mechanism of the agency problem's influence on a firm's capital investment decisions.

Personal cost theory argues that a firm's investments impose additional costs on executives (e.g., Aggarwal and Samwick, 2006) in the sense that if a firm either begins new projects or modifies existing projects, managers will have to assume larger responsibilities, and therefore, they need to either spend more time or work harder to acquire more knowledge and new skills. Based on the above argument, the thesis infers that if the personal costs of investment projects are very high, managers may discard some positive-NPV projects, thus causing underinvestment.

That said, Jensen (1986 & 1993) argues that managers normally have an impulse to invest because they can derive personal benefits from controlling more resources. Because of such "empire building", managers will even choose negative-NPV investment projects to maximize company size instead of shareholders' interests. Managers' preference for deriving personal benefits from negative-NPV projects will cause overinvestment. Some studies support the argument that executive compensation is more closely related to company size than to firm performance (e.g., Robert, 1956; Simon, 1957; Agrawal and Walking, 1994; Jones and Kato, 1996; Wan et al., 2008).

In Chapter 2, this thesis finds that Chinese listed SOEs regulate executive compensation. In Chapter 3, the thesis finds that SOEs are generally overinvested. However, Chinese SOEs normally do not have financing constraints, and Chinese governments have an impulse to obtain GDP growth, which requires SOEs to invest more. Thus from an agency-problem and financial constraint perspective, this thesis argues that because SOEs regulate executive compensation, their executives attempt

to overinvest to obtain more personal benefits so that they can compensate for the gap between their income and the incomes of private-firm executives.

Accordingly, the thesis formulates the following hypothesis:

Hypothesis 3: In Chinese listed SOEs, the degree of compensation regulation is positively related to the extent of the firm's unexpected investment.

4.5 Research Methodology

4.5.1 Samples

In this section, the thesis examines the relation between compensation regulation and firms' overinvestment. The study begins based on previous sections of this thesis. In Chapter 2, this thesis finds that because of compensation regulation, executive compensation in Chinese listed SOEs is below the market level. The thesis obtains the gap between the market-determined compensation level and actual executive compensation in Chapter 2; the thesis labeled that gap $COMPEN_{gap}$. The thesis investigates firms' investments in Chapter 3 and finds that, in general, Chinese listed SOEs are overinvested; the degree of overinvestment is I_{newerr} , which represents the unexpected part of a firm's investment.

The study in this section is based on previous studies in Chapters 2 and 3, and thus, the samples in this study are the same as in the two previous studies. In this section, this thesis uses $COMPEN_{gap}$ and I_{newerr} as inputs of regression.

4.5.2 Research methods

In this section, the thesis verifies Hypothesis 3, which argues that in Chinese listed SOEs, the degree of compensation regulation is positively related to the extent of a firm's overinvestment.

To check this hypothesis, this thesis first needs to determine the degree of compensation regulation and the firm's overinvestment. In the previous two chapters, the thesis has already obtained these two values. Figure 4.1 shows the details.

[Figure 4.1]

As discussed in Chapter 3, the thesis separates a firm's investment into two parts: investment to maintain existing assets and new investment. This thesis then separates new investment into two parts. Expected new investment can be described by a firm's growth opportunities and other determinants such as leverage, firm size, stock return, and free cash stock. Unexpected investment is defined as the gap between a firm's actual investment and its expected investment, as mentioned above. Unexpected investment can be positive or negative and refers to investments that cannot be explained by a firm's profile.

When unexpected investment is negative, it indicates that the firm is underinvested; when unexpected investment is positive, it indicates that the firm is overinvested. In addition, the absolute value of unexpected investment reflects the degree of a firm's under- or overinvestment.

In Chapter 2, the thesis studies executive compensation in listed Chinese firms. This thesis first constructs a market-determined compensation model based on all Chinese listed firms, including both SOEs and private firms. Second, the thesis calculates the difference between market-determined compensation and executives' actual compensation. The gap denotes whether a firm's executive compensation is higher or lower than the market level. If the sign is positive, the firm offers its executives less than the market level, and there is compensation regulation. Conversely, if the sign is negative, the firm offers its executives more than the market level, and there is overpayment.

In this section, this thesis checks the relation between unexpected investment and the compensation gap. If there is a significant and positive correlation between the two, it can infer that regulation of executive compensation is one cause of overinvestment.

4.5.3 Variables

There are eight variables in the regression. The dependent variable is the firm's unexpected investment, and the independent variable is the difference between market-determined compensation and an executive's actual compensation.

[Table 4.1]

Table 4.1 shows the eight variables to be checked in this section: a firm's unexpected investment (I_{newerr}) is defined and calculated in Chapter 3, and the extent of compensation regulation is measured in Chapter 2.

4.5.4 Model

The thesis checks the relation between a firm's unexpected investment and the extent of executive compensation regulation in this section based on the model set forth below.

$$I_{newerr} = \alpha + \beta_1 COMPENGAP + \beta_2 LNSIZE + \beta_3 COMPANYAGE + \beta_4 EXESHARE + \beta_5 SHARECON + \beta_6 IDRATIO + \beta_7 CEODUAL + Year Dummy + \varepsilon \quad (4-1)$$

In the above equation, if β_1 is significant and positive, it means that compensation regulation is a significant determinant of overinvestment. To control firm attributes, the thesis puts LNSIZE, COMPANYAGE, EXESHARE, SHARECON, IDRATIO

and CEODUAL into the model to reflect firm's corporate governance features. Year effects are also considered in the model to control business cycle and macroeconomic fluctuation year to year. This thesis runs the above regression for all listed firms, listed SOEs, listed central SOEs, and listed local SOEs to investigate whether ownership influences the relation between compensation regulation and a firm's investment behavior.

4.6 Results

4.6.1 Variable descriptive statistics

Table 4.2 shows the variable descriptive statistics for regression 4-1. This thesis lists four sample sets: all sample firms, all SOEs, central SOEs only, and local SOEs only.

[Table 4.2]

It is apparent that samples from SOEs occupy more than 50% of the total observations. Moreover, more than 86.6% of the SOEs sampled are local SOEs; approximately 45% of listed Chinese companies are local SOEs. One notable finding relates to the firm's unexpected investment (I_{newerr}) in various sample sets categorized by various types of ownership. The means of unexpected investment for all firms and local SOEs are positive, but the means of unexpected investment for all SOEs and central SOEs become negative. This result implies that although the number of central SOEs is small, the value of central SOEs' underinvestment is large, i.e., although the mean of unexpected investment for all SOEs is negative, that of local SOEs is positive. The implication of these figures is consistent with the results of regression 3-12 listed in Table 3.8.

4.6.2 Regression results

Tables 4.3, 4.4, and 4.5 show the regression results for Hypothesis 3. Table 4.3 lists the results for the regression that was run on all firms, all non-SOEs and all types of SOE samples. Table 4.4 shows the results for the regression that was run on all firms and all non-SOEs. For the purpose of comparison, this thesis also reports the regression results in Table 4.5 and Table 4.6, which include only observations for which I_{newerr} is positive and I_{newerr} is positive respectively. The difference between market-determined compensation and actual compensation (execomgap) used in Tables 4.3, 4.4, 4.5 and 4.6 is calculated based on a fixed effects panel data model. The thesis gives a detailed description of the model in Chapter 2.

In each table, the thesis gives the results for four or five subgroup sample sets. The “All firms” column shows the results for all samples, “Non-SOEs” shows the results for all non-SOE firms, “All SOEs” shows the results for all SOE samples, “Local SOEs” shows the results for local SOE samples, and “Central SOEs” shows the results for central SOE firms only.

[Table 4.3]

[Table 4.4]

[Table 4.5]

[Table 4.6]

Table 4.3 provides the regression results for the full set of observations, all non-SOEs and different type of SOEs. This thesis finds a significant and positive relation between compensation regulation and a firm’s unexpected investment in all firms. The result also shows that a significant and positive relation between compensation regulation and a firm’s unexpected investment in SOE firms with different types of ownership, but there does not exist a significant and relation between the two in non-SOE firms. The results show that, in general, compensation regulation is a significant determinant of more investment by all firms especially by SOEs. However, compensation regulation does not show significant relation to unexpected investment by non-SOEs. These findings may imply that agency problems are different in SOEs

than in non-SOEs; when compensation is regulated in SOEs, executives are more likely to conduct additional investment so that they can serve their own interests. Conversely, in private or non-SOE firms, when compensation is lower than the market level, executives have less motivation to make more investment or they do not have sufficient fund to support more investment.

To further clarify this point, in Table 4.4, the thesis lists the results of the regression conducted in all firms and in all non-SOE samples with observations when the unexpected investment is either positive or negative. The table shows that for all non-SOEs, when I_{newerr} is positive, the relation between the compensation gap and a firm's unexpected investment is positive; when I_{newerr} is negative, the relation between the compensation gap and a firm's unexpected investment is negative. As discussed in previous sections, a positive I_{newerr} indicates that a firm is overinvested, whereas a negative I_{newerr} indicates that a firm is underinvested. Therefore, the results in Table 4.3 and 4.4 reveal that the agency problem caused by compensation regulation in SOEs is overinvestment, whereas in non-SOEs, there does not exist a significant relation between compensation regulation and firm's inefficient investment, so the agency problem in non-SOEs may be different from that in SOEs. Meanwhile, for non-SOEs there is a significant and positive relation between executive compensation gap and firm's inefficient investment in firms with overinvestment; a negative relation is found between the two in firms with underinvestment. Some scholars (e.g.: Tang et al., 2011; Yu et al., 2012; Peng et al., 2016) find that either political connection or close relation with banks can remove or relieve financing constraints of non-SOEs. Thus the implication of above findings is that among non-SOEs without or with relatively less financing constraints, the compensation regulation will cause executives to make more investment while among those non-SOEs with strong financing constraints, such regulation will cause executives to be shirking thus lead firm underinvestment. This difference also complies with previous theories (Wu and Yu, 2009; Luo et al., 2012). Because SOEs normally do not have financing constraints, it is much easier for them to make more investments than it is for

non-SOEs, which generally lack funds. Therefore, when SOE executives find that their incomes are below the market level, they find it relatively easier to make additional investments that they can use to serve their own interests. However, because non-SOEs normally experience financing constraints, when executives in non-SOEs believe that their compensation is lower than the market level, it is very difficult for them to choose making more investments because of financing constraints; accordingly, the better choice for those executives is shirking.

Table 4.5 reports the results for observations where I_{newerr} is positive, namely, where a firm's unexpected investment is positive or the sampled firms are overinvested. The results are similar to the data in Table 4.3. For all SOEs (including both central and local SOEs), compensation regulation is positively related to overinvestment. Therefore, Hypothesis 3 is proven. The findings are slightly different from those of Xin et al. (2007), who report a positive relation between compensation regulation and firm overinvestment only in local SOEs. One possible explanation for this discrepancy can be that over the past ten years, the government has loosened its direct administration of central SOEs. Another notable finding is that in overinvested non-SOE firms, compensation regulation is positively related to overinvestment. The implication of this finding shows that in non-SOE firms without financing constraints, overinvestment is associated with lower executive compensation, indicating the same agency problem occurs in non-SOEs as that in SOEs.

Table 4.6 reports the results for observations where I_{newerr} is negative, namely, where a firm's unexpected investment is negative or the sampled firms are underinvested. For all SOEs (including both central and local SOEs), compensation regulation is negatively related to unexpected investment. For all non-SOEs, the negative relation between compensation gap and firm's unexpected investment is also observed. Some scholars (e.g.: Lin and Bo, 2012; Firth et al., 2012) argue that state ownership does not necessarily help in reducing the firm's financing constraints on investment. Meanwhile non-SOEs are normally suffering financing constraints. The findings

above reveal that when facing financing constraints, executives in both SOEs and non-SOEs choose to make less investment due to either fund shortage or shirking preference.

4.6.3 Robustness test

4.6.3.1 Robustness test based on system GMM estimation

To test the robustness of the research in this section, this thesis first uses system GMM estimators of dynamic panel data models to predicate both executive compensation level and firm's investment level in chapter 2 and chapter 3 respectively and then uses the data from the estimation to check the relation between firm's unexpected investment and executive compensation gap between the market determined compensation level and actual compensation. Table 4.7, Table 4.8, Table 4.9 and Table 4.10 show the regression results.

[Table 4.7]

[Table 4.8]

[Table 4.9]

[Table 4.10]

As shown in above tables, the signs of all coefficients in the regressions based on system GMM estimator of dynamic panel data models remain the same as those in previous regressions based on fixed effects estimator of panel data models. The relation between compensation regulation and overinvestment is significantly positive in all SOEs at 0.01 level but significantly negative in all non-SOEs now at 0.1 level. The outputs demonstrate that this research is robust in general for SOEs. For Non-SOEs, the outputs of regressions based on system GMM estimator reveal that executive compensation gap is negatively associated with firm's investment which indicates that executives in non-SOEs choose shirking when their compensation is regulated to below market level. Among all non-SOEs, when the companies have over-investment (i.e. $I_{newerr} \geq 0$), the executive compensation gap is positively related to investment gap (i.e. I_{newerr}); when companies have under-investment (i.e.

$I_{newerr} \leq 0$), executive compensation gap has a negative relation with investment gap. The results demonstrate that in general executives in non-SOEs trend to choose under-investment when their compensations are below market level. So the agency problems in non-SOEs are, different from that in SOEs, underinvestment due to management's shirking. These findings may imply that agency problems are different in SOEs than in non-SOEs; when compensation is regulated in SOEs, executives are more likely to conduct additional investment so that they can serve their own interests. Conversely, in private or non-SOE firms, when compensation is lower than the market level, executives have less motivation to make more investment or they do not have sufficient fund to support more investment thus choose to make fewer investments so that they can avoid additional responsibilities.

For all SOEs (including both central and local SOEs), compensation regulation is positively related to overinvestment both in fixed effects estimation and system GMM estimation. Therefore, Hypothesis 3 is proven.

4.6.3.2 Robustness test considering 2008 global financial crisis

There was a severe global financial crisis since 2008. How does this crisis affect China, specifically firm investment in Chinese listed firms and the relation between executive compensation regulation and firm investment behavior this thesis is investigating?

Some scholars (e.g.: Jia, 2008; Liao, 2008; Bo et al., 2014) argue that global financial crisis affects China's economy through three ways: export lose, investment lose and confidence lose. Thus the crisis has a negative impact to Chinese corporate investment (Bo et al., 2014). However, to counter the impact of this financial crisis, from 2009 to 2010, Chinese government launched economy stimulate plan by injecting roughly 4-trillion investment to public infrastructures such as airport, railway, rural area development and Tax refund, etc. Many studies (e.g.: Guo et al.,

2009; Liu, 2012; Chen, 2014) report that the 4-trillion investment plan drives Chinese macro economy a V-shape turnaround from 2008 to 2009. During the same period, the plan also increased the overall investments of Chinese firms. Contribution of capital formation to GDP rate quickly increased to 87.6% in 2009 (Liu, 2012). Thus the global financial crisis may shock to credit markets and the financial crisis has worsened credit market conditions in which the quantity of credit available for borrowers is lower and costs of borrowing are higher (Ivashina and Scharfstein, 2010). Under such a condition, firms normally cut capital expenditures, reduce debt issuance, draw down lines of credit, and substitute internal liquidity for external liquidity (Campello et al., 2010; Duchin et al., 2011). However, Kahle and Stulz (2010), Paunova (2010) document that corporate behaviours during the financial crisis are not always consistent with the predictions of the financing constraints theory, instead firms respond directly to a contraction in demand and to risk (Kahle and Stulz, 2010). Chinese investment stimulate plan brings additional fuzziness to this argument because the plan encourage the firms to investment more by loosen the credit control and by tax refund.

To test whether the relation between executive compensation gap and firm's unexpected investment is still remaining the same without the impact from financial crisis and 4-trillion investment plan, the thesis conducts a robustness test by stopping the samples after year of 2008. Below Table 4.11 shows the results of regression based on fixed effects estimations predicating both executive compensation level and firm's investment level.

[Table 4.11]

As shown in the above table, the signs of all coefficients in the regressions based on fixed effects estimator of panel data models with subsamples prior to year of 2009 remain the same as those in previous regressions based on full sample sets. The relation between compensation regulation and unexpected investment is significantly positive in all SOEs at 0.01 level and significantly negative in all non-SOEs at 0.01

level too. For local SOEs, such relation is also significantly positive but for central SOEs the relation is not significant although it is still positive. The outputs demonstrate that in general the research method adopted by this thesis is robust even when the thesis takes impact to firm's investment behaviors from global financial crisis into consideration. One possible explanation for relatively weak positive relation between compensation gap and firm's unexpected investment in central SOEs is that central SOEs are monitored directly by central SASAC, so it is more difficult for executives in central SOEs to make overinvestment even central SOEs normally do not have financing constraints.

4.7 Conclusion and Discussion

In this section, this thesis checks the relation between compensation regulation and overinvestment by Chinese listed firms.

The thesis finds a significant and positive relation between the extent of compensation regulation and the degree of a listed SOE's overinvestment. For those SOEs that are not overinvested, namely, SOEs with a negative I_{newerr} , this thesis finds that compensation regulation decreases a firm's investment. These findings reveal that compensation regulation causes agency problems in SOEs in two ways. Normally Chinese SOEs do not have financing constraints so it is easy for SOE executives to make more investments that serve their own interests (Li et al., 2007). On the other hand when because of some reasons there are financing constraints in SOEs, executives will choose less investment due to either fund shortage or shirking preference. Unlike some other studies (e.g., Xin et al., 2007), the thesis finds local and central SOEs show a similar relation between compensation regulation and investment behavior. The evidence provided in this section supports the argument that the regulation of executive compensation is associated with overinvestment in Chinese listed SOEs.

Non-SOEs also show two relations between compensation regulation and firm investment. Because non-SOEs typically experience financing constraints when they raise funds for investment, executives find it difficult to increase firm investment even if they want to do so to fulfill their own interests. Therefore, when an executive's compensation is regulated to below the market level, the easier choice is to decrease investment so that they can expend less effort on the job. In the context of compensation regulation, executives of non-SOEs choose shirking, whereas executives of SOEs pursue their own interests through overinvestment. This difference reflects the different external political and economic conditions experienced by SOEs and non-SOEs and provides good support for previous studies showing that SOEs have much weaker financing constraints than non-SOEs (e.g., Wang, 2009; Shen et al., 2010). Meanwhile, when facing financing constraints, executives in both SOEs and non-SOEs choose to make less investment due to either fund shortage or shirking preference.

4.8 Research Limitations and Discussion of Future Studies

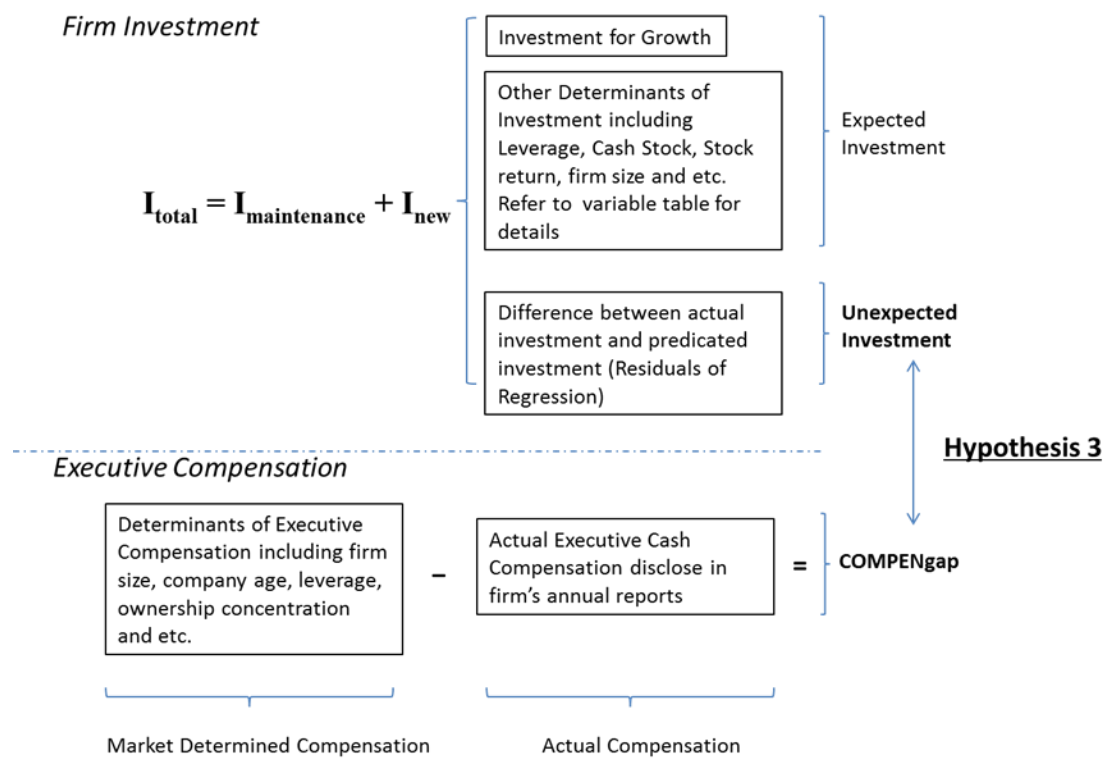
In the previous sections of this thesis, the thesis studied the regulation of executive compensation in Chinese listed firms and inefficient investment by firms. Empirical studies show not only that compensation regulation exists in Chinese SOEs but also that Chinese listed SOEs are generally overinvested. This study also reveals that compensation regulation has a positive relation with overinvestment in Chinese SOEs, whether they are central or local.

Although the study is robust, it has several limitations. First, this thesis only analyzed executive cash compensation because although equity-based compensation is growing, it currently remains a small portion of total compensation. In the future, equity incentives will be an important part of the total compensation package, and possible researches should focus on this issue later.

Second, to measure each firm's investment opportunities, this thesis used its average Tobin's Q. However, only a firm's marginal Q can reflect both firm performance and operational characteristics (Hayashi, 1982). Because Chinese stock is only reaching (or approaching) weak effectiveness (Wu, 1996; Lan et al., 2005), the stock price of listed Chinese firms merely reflects their historical information. Therefore, as an index of a firm's future investment opportunity based on stock price, average Q inevitably results in measurement errors. In future studies, margin Q would be the preferable choice, although it is very difficult to calculate.

In future studies, more and sufficient firm-year observations of central SOE samples should also be collected to check the relation between a firm's annual new investment and the sensitivity between free cash flow and investment.

Figure 4.1 Study framework of Hypothesis 3



This figure presents study framework of hypothesis 3 to verify relation between executive compensation and firm's inefficient investment. To deploy the study, this thesis first needs to determine the degree of compensation regulation and then the firm's overinvestment.

Table 4.1 Variable definitions of the regression for Hypothesis 3

Variable	Name	Definition
Firm's Unexpected Investment (Dependent Variable)	Inewerr	Difference between a firm's actual and expected investment
Extent of Compensation Regulation	EXECOMGAY	Market-determined compensation – Actual compensation
Company Size	LNSIZE	Natural log of firm total assets
Publicly listed duration	COMPANYAGE	Natural log of total years since IPO
Management Ownership	EXESHARE	(Management ownership)/(Total ownership)
Blockholder	SHARECON	(Ownership of the largest shareholder)/(Total ownership)
Independent Director Ratio	IDRATIO	(Num. of independent directors)/(Num. of all directors)
CEO Duality	CEODUAL	Dummy Variable, 1: CEO and Chairman are the same person; 0: CEO and Chairman are two persons

This table presents variable definitions of regression to verify relation between firm's unexpected investment and executive compensation gap to market level.

Table 4.2 Variable descriptive statistics for regression to verify relation between firm inefficient investment and executive compensation gap

Variable	Obs	Mean	Std.Dev.	Min	Max
Inewerr	9902	0.0007058	0.05478	-0.2187	0.2853
EXECOMGAP	9902	473545.2	3724985	-6.70e+07	1.81e+08
LNSIZE	9902	21.54605	1.24315	15.41772	28.40521
COMPANYAGE	9902	1.759339	1.147326	-5.899897	3.093282
EXESHARE	9902	0.0529188	0.1481761	0	0.891
SHARECON	9902	36.46624	15.23286	0.082	88.55
IDRATIO	9902	0.3616346	0.0506886	0.0833333	0.7142857
CEODUAL	9902	0.1913157	.3933531	0	1

Note:

- Inewerr is Firm's Unexpected Investment which is defined as: Difference between a firm's actual and expected investment
- EXECOMGAP is executive compensation gap between market determined level and actual level.

This table presents Variable descriptive statistics for regression to verify relation between firm inefficient investment and executive compensation gap.

Table 4.3 Results of the regression for Hypothesis 3 (SOE Sample) under Fixed Effects Estimator

	Panel I	Panel II	Panel III	Panel IV	Panel V
VARIABLES	All Firms	Non-SOEs	SOEs	Local SOEs	Central SOEs
execomgap	79.12*** (14.07)	3.286 (1.140)	119.2*** (12.44)	106.1*** (9.734)	145.7*** (6.042)
lnsize	190,700,000*** (13.05)	102,300,000*** (14.10)	228,000,000*** (8.715)	246,000,000*** (9.209)	234,400,000** (2.448)
companyage	-17,190,000 (-0.637)	14,440,000 (1.261)	50,540,000 (0.876)	886,878 (0.0159)	348,300,000 (1.357)
exeshare	259,100,000 (1.538)	-3,388,000 (-0.0588)	4,267,000,000 (1.412)	2,944,000,000 (0.987)	11,030,000,000 (0.967)
sharecon	-1,789,000 (-1.507)	-1,705,000*** (-2.992)	-1,729,000 (-0.806)	-92,572 (-0.0449)	-11,780,000 (-1.192)
idratio	-1,021,000,000*** (-3.065)	-321,200,000** (-2.151)	-1,918,000,000*** (-3.108)	-1,078,000,000* (-1.742)	-5,083,000,000** (-2.266)
CEODUAL	42,250,000 (0.928)	12,210,000 (0.692)	-4,260,000 (-0.0403)	-11,690,000 (-0.116)	109,400,000 (0.211)
Year Effects	Yes	Yes	Yes	Yes	Yes
Constant	-3,565,000,000*** (-10.84)	-1,996,000,000*** (-12.31)	-4,219,000,000*** (-7.063)	-4,838,000,000*** (-7.934)	-3,633,000,000 (-1.642)
Observations	9,902	4,608	5,294	4,621	673
Adj. R-squared	0.046	0.050	0.059	0.052	0.103
F Value	36.66	18.66	25.66	19.26	5.8

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- l) Execomgap is total cash compensation gap (between actual level and market determined level) of all top executives in the firm. Unit is CNY.
- m) lnsize denotes firm size which is natural logarithm of firm's total assets.
- n) Companyage is Natural log of total years since firm IPO
- o) EXESHARE denotes executives' ownership, calculated as: (Management ownership)/(Total ownership)
- p) SHARECON denotes firm's ownership concentration percentage, defined as: (Ownership of the largest shareholder)/(Total ownership) *100%
- q) IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- r) CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents the results of the regression to verify relation between firm's inefficient investment and executive compensation gap. The table reports results of five regressions. The first regression is run on all firms. The second regression is run on all non-SOEs. The third regression is run on all SOEs. The fourth regression is run on all local SOEs and the last regression is run on all central SOEs. All regressions are under fixed effects panel data estimators.

Table 4.4 Results of the regression for Hypothesis 3 (Non-SOEs samples) under Fixed Effects Estimator

	Panel I	Panel II	Panel III	Panel IV
	All Inewerr	All Inewerr	Inewerr≤=0	Inewerr>0
VARIABLES	All Firms	All Non-SOEs	Non-SOEs	Non-SOEs
execomgap	79.12*** (14.07)	3.286 (1.140)	-8.837*** (-4.678)	19.76*** (4.137)
lnsize	1.907e+08*** (13.05)	1.023e+08*** (14.10)	-1.150e+08*** (-26.04)	3.196e+08*** (23.65)
companyage	-1.719e+07 (-0.637)	1.444e+07 (1.261)	2.929e+06 (0.437)	1.246e+07 (0.575)
exeshare	2.591e+08 (1.538)	-3.388e+06 (-0.0588)	2.407e+06 (0.0741)	8.891e+07 (0.768)
sharecon	-1.789e+06 (-1.507)	-1.705e+06*** (-2.992)	-1.326e+06*** (-4.022)	1.063e+06 (0.971)
idratio	-1.021e+09*** (-3.065)	-3.212e+08** (-2.151)	-2.767e+08*** (-3.283)	-1.369e+08 (-0.460)
CEODUAL	4.225e+07 (0.928)	1.221e+07 (0.692)	1.152e+06 (0.113)	-1.616e+07 (-0.479)
Year Effects	Yes	Yes	Yes	Yes
Constant	-3.565e+09*** (-10.84)	-1.996e+09*** (-12.31)	2.483e+09*** (25.61)	-6.618e+09*** (-21.52)
Observations	9,902	4,608	2,811	1,797
R-squared	0.046	0.050	0.240	0.276
F Value	36.65	18.66	67.76	52.39

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- Execomgap is total cash compensation gap (between actual level and market determined level) of all top executives in the firm. Unit is CNY.
- lnsize denotes firm size which is natural logarithm of firm's total assets.
- Companyage is Natural log of total years since firm IPO
- EXESHARE denotes executives' ownership, calculated as: (Management ownership)/(Total ownership)
- SHARECON denotes firm's ownership concentration percentage, defined as: (Ownership of the largest shareholder)/(Total ownership) *100%
- IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents the results of the regression to verify relation between firm's inefficient investment and executive compensation gap. The table reports results of four regressions. The first regression is run on all firms. The second regression is run on all non-SOEs. The third regression is run on all non-SOEs with unexpected investment (Inewerr) smaller than or equal to zero, namely non-SOEs with underinvestment. The fourth regression is run on all non-SOEs with unexpected investment (Inewerr) bigger than zero, namely non-SOEs with overinvestment.

Table 4.5 Results of the Regression for Hypothesis 3 under Fixed Effects
Estimator—companies with overinvestment

(Inewerr>=0)	Panel I	Panel II	Panel III	Panel IV	Panel V
VARIABLES	All Firms	Non-SOEs	All SOEs	Local SOEs	Central SOEs
execomgap	157.8*** (15.96)	19.76*** (4.137)	212.5*** (12.87)	201.5*** (10.80)	186.2*** (4.512)
lnsize	6.853e+08*** (24.15)	3.196e+08*** (23.65)	8.552e+08*** (17.31)	7.654e+08*** (14.24)	1.254e+09*** (7.932)
companyage	-3.210e+08*** (-5.929)	1.246e+07 (0.575)	-6.048e+08*** (-5.447)	-5.834e+08*** (-4.973)	-4.225e+08 (-1.177)
exeshare	-1.227e+08 (-0.344)	8.891e+07 (0.768)	-1.127e+09 (-0.140)	1.384e+09 (0.149)	-6.425e+09 (-0.383)
sharecon	7.499e+06*** (3.181)	1.063e+06 (0.971)	9.222e+06** (2.288)	9.136e+06** (2.166)	6.861e+06 (0.502)
idratio	-1.568e+09** (-2.399)	-1.369e+08 (-0.460)	-3.201e+09*** (-2.891)	-1.975e+09 (-1.623)	-1.076e+10*** (-3.659)
CEODUAL	3.822e+07 (0.422)	-1.616e+07 (-0.479)	7.404e+07 (0.366)	5.919e+07 (0.283)	1.150e+09 (1.469)
Year Effects	Yes	Yes	Yes	Yes	Yes
Constant	-1.356e+10*** (-21.10)	-6.618e+09*** (-21.52)	-1.632e+10*** (-14.52)	-1.482e+10*** (-12.10)	-2.295e+10*** (-6.598)
Observations	4,079	1,797	2,282	2,012	270
R-squared	0.231	0.276	0.268	0.196	0.527
F Value	93.99	52.39	63.94	37.53	21.98

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- Execomgap is total cash compensation gap (between actual level and market determined level) of all top executives in the firm. Unit is CNY.
- lnsize denotes firm size which is natural logarithm of firm's total assets.
- Companyage is Natural log of total years since firm IPO
- EXESHARE denotes executives' ownership, calculated as: (Management ownership)/(Total ownership)
- SHARECON denotes firm's ownership concentration percentage, defined as: (Ownership of the largest shareholder)/(Total ownership) *100%
- IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents the results of the regressions to verify relation between firm's inefficient investment and executive compensation gap. The table reports results of five regressions. All five regressions are run among samples with unexpected investment (Inewerr) is positive, namely companies with overinvestment. The first regression is run on all firms; the second regression is run on all non-SOEs; the third regression is run on all SOEs; the fourth regression is run on all local SOEs and the last regression is run on all central SOEs.

Table 4.6 Results of the Regression for Hypothesis 3 under Fixed Effects
Estimator—companies with underinvestment

(Inewerr≤0)	Panel I	Panel II	Panel III	Panel IV	Panel V
VARIABLES	All Firms	Non-SOEs	All SOEs	Local SOEs	Central SOEs
execomgap	-93.05*** (-16.66)	-13.01*** (-5.112)	-132.0*** (-14.94)	-93.58*** (-11.18)	-308.4*** (-9.270)
lnsize	-2.331e+08*** (-21.78)	-8.273e+07*** (-16.46)	-2.930e+08*** (-17.26)	-2.336e+08*** (-14.53)	-4.909e+08*** (-6.875)
companyage	2.148e+08*** (11.38)	303,782 (0.0383)	3.492e+08*** (10.57)	2.962e+08*** (9.886)	7.186e+08*** (4.064)
exeshare	4.334e+08 (1.463)	1.095e+07 (0.125)	-7.892e+08 (-0.181)	9.297e+08 (0.244)	-2.684e+11 (-0.721)
sharecon	-2.082e+06*** (-2.652)	-1.116e+06*** (-2.906)	-2.492e+06** (-2.050)	-2.400e+06** (-2.175)	-1.083e+06 (-0.167)
idratio	-7.882e+08*** (-3.405)	-3.068e+08*** (-3.075)	-9.281e+08** (-2.469)	-5.735e+08* (-1.665)	-1.428e+09 (-0.790)
CEODUAL	-2.266e+07 (-0.713)	-1.751e+06 (-0.141)	-1.120e+07 (-0.197)	-3.117e+07 (-0.603)	3.003e+08 (1.042)
Year Effects	Yes	Yes	Yes	Yes	Yes
Constant	4.780e+09*** (19.94)	1.820e+09*** (16.31)	5.872e+09*** (15.28)	4.602e+09*** (12.65)	9.432e+09*** (5.805)
Observations	2,932	1,201	1,731	1,557	174
R-squared	0.281	0.244	0.352	0.282	0.648
F Value	114.09	38.32	93.55	60.64	30.03

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- h) Execomgap is total cash compensation gap (between actual level and market determined level) of all top executives in the firm. Unit is CNY.
- i) Insize denotes firm size which is natural logarithm of firm's total assets.
- j) Companyage is Natural log of total years since firm IPO
- k) EXESHARE denotes executives' ownership, calculated as: (Management ownership)/(Total ownership)
- l) SHARECON denotes firm's ownership concentration percentage, defined as: (Ownership of the largest shareholder)/(Total ownership) *100%
- m) IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- n) CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents the results of the regressions to verify relation between firm's inefficient investment and executive compensation gap. The table reports results of five regressions. All five regressions are run among samples with unexpected investment (Inewerr) is positive, namely companies with overinvestment. The first regression is run on all firms; the second regression is run on all non-SOEs; the third regression is run on all SOEs; the fourth regression is run on all local SOEs and the last regression is run on all central SOEs.

Table 4.7 Results of the Regression for Hypothesis 3 under system GMM DPD Estimator

	Panel I	Panel II	Panel III	Panel IV	Panel V
VARIABLES	All Firms	Non-SOEs	SOEs	Local SOEs	Central SOEs
execomgap	103.0*** (20.63)	-4.104* (-1.796)	142.4*** (17.90)	129.6*** (12.67)	159.8*** (9.309)
lnsize	-2.011e+07 (-1.192)	-3.804e+07*** (-5.858)	-5.599e+06 (-0.187)	4.914e+07 (1.562)	-8.350e+07 (-0.800)
companyage	2.610e+06 (0.0912)	4.282e+06 (0.455)	7.119e+07 (1.148)	-2.321e+07 (-0.390)	6.202e+08** (2.181)
exeshare	2.363e+08 (1.315)	-4.259e+07 (-0.887)	1.496e+09 (0.464)	1.773e+08 (0.0563)	7.238e+09 (0.576)
sharecon	7.293e+06*** (5.652)	-1.312e+06*** (-2.680)	1.056e+07*** (4.538)	1.021e+07*** (4.550)	9.092e+06 (0.837)
idratio	-9.383e+08*** (-2.639)	-3.675e+08*** (-2.949)	-1.685e+09** (-2.547)	-1.469e+09** (-2.239)	-1.519e+09 (-0.613)
CEODUAL	-3.152e+07 (-0.648)	1.295e+07 (0.880)	-1.497e+08 (-1.320)	-1.721e+08 (-1.605)	1.623e+08 (0.284)
Year Effects	Yes	Yes	Yes	Yes	Yes
Constant	5.074e+08 (1.364)	9.489e+08*** (6.648)	1.952e+08 (0.293)	-8.368e+08 (-1.201)	7.130e+08 (0.296)
Observations	9,902	4,608	5,294	4,621	673
Adj. R-squared	0.050	0.017	0.073	0.055	0.130
F Value	39.58	6.1	31.98	20.63	7.55

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- Execomgap is total cash compensation gap (between actual level and market determined level) of all top executives in the firm. Unit is CNY.
- lnsize denotes firm size which is natural logarithm of firm's total assets.
- Companyage is Natural log of total years since firm IPO
- EXESHARE denotes executives' ownership, calculated as: (Management ownership)/(Total ownership)
- SHARECON denotes firm's ownership concentration percentage, defined as: (Ownership of the largest shareholder)/(Total ownership) *100%
- IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents the results of the regression to verify relation between firm's inefficient investment and executive compensation gap among all SOEs. To check robustness of this study, the thesis uses system GMM estimator in determining both executive compensation and firm investment level. The table reports results of five regressions. The first regression is run on all firms. The second regression is run on all non-SOEs. The third regression is run on all SOEs. The fourth regression is run on all local SOEs and the last regression is run on all central SOEs.

Table 4.8 Results of the Regression for Hypothesis 3 under system GMM DPD Estimator – Non-SOEs

	Panel I	Panel II	Panel III	Panel IV
	All Inewerr	All Inewerr	Inewerr<=0	Inewerr>0
VARIABLES	All Firms	All Non-SOEs	Non-SOEs	Non-SOEs
execomgap	103.0*** (20.63)	-4.104* (-1.796)	-25.49*** (-11.18)	43.37*** (14.35)
lnsize	-2.011e+07 (-1.192)	-3.804e+07*** (-5.858)	-1.694e+08*** (-24.02)	1.360e+08*** (18.19)
companyage	2.610e+06 (0.0912)	4.282e+06 (0.455)	-1.147e+07 (-1.140)	1.032e+07 (0.933)
exeshare	2.363e+08 (1.315)	-4.259e+07 (-0.887)	-6.119e+07 (-1.212)	4.661e+07 (0.811)
sharecon	7.293e+06*** (5.652)	-1.312e+06*** (-2.680)	-1.828e+06*** (-3.602)	2.351e+06*** (3.902)
idratio	-9.383e+08*** (-2.639)	-3.675e+08*** (-2.949)	-4.141e+08*** (-3.220)	1.990e+08 (1.295)
CEODUAL	-3.152e+07 (-0.648)	1.295e+07 (0.880)	-3.822e+06 (-0.241)	-2.022e+07 (-1.184)
Year Effects	Yes	Yes	Yes	Yes
Constant	5.074e+08 (1.364)	9.489e+08*** (6.648)	3.725e+09*** (24.37)	-2.931e+09*** (-17.45)
Observations	9,902	4,608	2,811	1,797
R-squared	0.050	0.017	0.308	0.319
F Value	39.58	6.1	91.7	68.06

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- Execomgap is total cash compensation gap (between actual level and market determined level) of all top executives in the firm. Unit is CNY.
- lnsize denotes firm size which is natural logarithm of firm's total assets.
- Companyage is Natural log of total years since firm IPO
- EXESHARE denotes executives' ownership, calculated as: (Management ownership)/(Total ownership)
- SHARECON denotes firm's ownership concentration percentage, defined as: (Ownership of the largest shareholder)/(Total ownership) *100%
- IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents the results of the regression to verify relation between firm's inefficient investment and executive compensation gap. To check robustness of this study, the thesis uses system GMM estimator in determining both executive compensation and firm investment level.

The table reports results of four regressions. The first regression is run on all firms. The second regression is run on all non-SOEs. The third regression is run on all non-SOEs with unexpected investment ($Inewerr$) smaller than or equal to zero, namely non-SOEs with underinvestment. The fourth regression is run on all non-SOEs with unexpected investment ($Inewerr$) bigger than or equal to zero, namely non-SOEs with overinvestment.

**Table 4.9 Results of the Regression for Hypothesis 3 under system GMM DPD
Estimator – companies with overinvestment**

(Inewerr>=0)	Panel I	Panel II	Panel III	Panel IV	Panel V
VARIABLES	All Firms	Non-SOEs	All SOEs	Local SOEs	Central SOEs
execomgap	203.9*** (24.59)	217.2*** (17.94)	351.7*** (15.87)	153.9*** (9.587)	43.37*** (14.35)
lnsize	4.205e+08*** (13.62)	6.544e+08*** (12.20)	3.380e+08*** (5.254)	1.130e+09*** (8.115)	1.360e+08*** (18.19)
companyage	-1.428e+08*** (-2.650)	-2.021e+08* (-1.798)	-9.741e+07 (-0.841)	-8.491e+07 (-0.214)	1.032e+07 (0.933)
exeshare	3.110e+08 (0.901)	-2.834e+08 (-0.0428)	6.594e+08 (0.0986)	-1.998e+09 (-0.0748)	4.661e+07 (0.811)
sharecon	1.933e+07*** (7.843)	2.271e+07*** (5.269)	2.831e+07*** (6.258)	2.595e+07* (1.729)	2.351e+06*** (3.902)
idratio	-6.041e+08 (-0.876)	-2.446e+09** (-1.978)	-2.275e+09* (-1.762)	-4.857e+09 (-1.266)	1.990e+08 (1.295)
CEODUAL	-5.469e+06 (-0.0594)	-6.576e+06 (-0.0299)	1.426e+06 (0.00645)	3.571e+08 (0.375)	-2.022e+07 (-1.184)
Year Effects	Yes	Yes	Yes	Yes	Yes
Constant	-8.990e+09*** (-13.10)	-1.350e+10*** (-11.37)	-7.249e+09*** (-5.225)	-2.353e+10*** (-7.336)	-2.931e+09*** (-17.45)
Observations	4,079	1,797	2,282	2,012	270
R-squared	0.249	0.283	0.226	0.554	0.319
F Value	107.89	70.99	46.03	25.48	68.06

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- Execomgap is total cash compensation gap (between actual level and market determined level) of all top executives in the firm. Unit is CNY.
- lnsize denotes firm size which is natural logarithm of firm's total assets.
- Companyage is Natural log of total years since firm IPO
- EXESHARE denotes executives' ownership, calculated as: (Management ownership)/(Total ownership)
- SHARECON denotes firm's ownership concentration percentage, defined as: (Ownership of the largest shareholder)/(Total ownership) *100%
- IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents the results of the regressions to verify relation between firm's inefficient investment and executive compensation gap. To check robustness of this study, the thesis uses system GMM estimator in determining both executive compensation and firm investment level.

The table reports results of five panels. All five panels are run among samples with unexpected

investment (Inewerr) is positive, namely companies with overinvestment. The first regression is run on all firms; the second regression is run on all non-SOEs; the third to fifth regression is run on all SOEs; the fourth regression is run on all local SOEs and the last regression is run on all central SOEs.

Table 4.10 Results of the Regression for Hypothesis 3 under System GMM DPD
Estimator—companies with underinvestment

(Inewerr<=0)	Panel I	Panel II	Panel III	Panel IV	Panel V
VARIABLES	All Firms	Non-SOEs	All SOEs	Local SOEs	Central SOEs
execomgap	-25.28*** (-6.260)	-30.41*** (-7.108)	-16.70*** (-2.873)	-12.50*** (-3.135)	-10.09 (-0.263)
lnsize	-2.358e+08*** (-24.95)	-1.316e+08*** (-14.13)	-2.934e+08*** (-20.71)	-2.237e+08*** (-22.67)	-5.716e+08*** (-6.145)
companyage	8.257e+07*** (5.112)	5.458e+06 (0.411)	1.525e+08*** (5.383)	1.100e+08*** (5.829)	4.221e+08* (1.719)
exeshare	1.366e+08 (0.588)	5.061e+06 (0.0365)	2.098e+09 (0.555)	1.173e+09 (0.485)	5.235e+10 (0.115)
sharecon	-2.535e+06*** (-3.811)	-1.553e+06** (-2.352)	-2.779e+06*** (-2.800)	-2.363e+06*** (-3.579)	-7.356e+06 (-0.860)
idratio	-4.500e+08** (-2.306)	-6.612e+08*** (-3.847)	-3.183e+08 (-1.039)	-1.473e+08 (-0.711)	3.263e+08 (0.143)
CEODUAL	5.697e+06 (0.211)	1.367e+07 (0.634)	8.004e+06 (0.171)	-4.974e+06 (-0.159)	4.746e+07 (0.126)
Year Effects	Yes	Yes	Yes	Yes	Yes
Constant	4.986e+09*** (24.03)	2.973e+09*** (14.80)	6.057e+09*** (19.08)	4.578e+09*** (20.74)	1.152e+10*** (5.431)
Observations	4,079	1,797	2,282	2,012	270
R-squared	0.298	0.287	0.320	0.368	0.398
F Value	119.14	45.35	78.15	87.78	9.97

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- Execomgap is total cash compensation gap (between actual level and market determined level) of all top executives in the firm. Unit is CNY.
- lnsize denotes firm size which is natural logarithm of firm's total assets.
- Companyage is Natural log of total years since firm IPO
- EXESHARE denotes executives' ownership, calculated as: (Management ownership)/(Total ownership)
- SHARECON denotes firm's ownership concentration percentage, defined as: (Ownership of the largest shareholder)/(Total ownership) *100%
- IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents the results of the regressions to verify relation between firm's inefficient investment and executive compensation gap. The table reports results of five regressions. All five regressions are run among samples with unexpected investment (Inewerr) is positive, namely companies with overinvestment. The first regression is run on all firms; the second regression is run on all non-SOEs; the third regression is run on all SOEs; the fourth regression is run on all local SOEs and the last regression is run on all central SOEs.

**Table 4.11 Results of the Regression for Hypothesis 3 under Fixed effects
Estimator–Subsamples prior to Year 2009**

	Panel I	Panel II	Panel III	Panel IV	Panel V
VARIABLES	All Firms	Non-SOEs	All SOEs	Local SOEs	Central SOEs
execomgap	62.08*** (6.022)	-16.46*** (-5.086)	85.94*** (5.464)	88.89*** (6.408)	46.59 (0.559)
lnsize	2.101e+08*** (10.38)	5.328e+07*** (8.160)	2.682e+08*** (8.471)	2.037e+08*** (7.235)	6.364e+08*** (3.446)
companyage	4.278e+06 (0.113)	1.880e+07* (1.842)	5.262e+07 (0.825)	8.312e+07 (1.520)	-3.279e+06 (-0.00759)
exeshare	5.055e+08 (0.632)	4.308e+07 (0.293)	6.931e+09 (0.635)	8.496e+09 (0.919)	2.325e+08 (0.00276)
sharecon	-31,995 (-0.0205)	-1.166e+06** (-2.253)	-136,325 (-0.0586)	1.293e+06 (0.653)	-1.654e+07 (-0.986)
idratio	-1.177e+09** (-2.511)	-1.648e+08 (-1.195)	-2.009e+09*** (-2.778)	-1.691e+09*** (-2.718)	-7.071e+09 (-1.500)
CEODUAL	1.804e+06 (0.0281)	1.390e+07 (0.844)	-5.991e+07 (-0.542)	-4.859e+07 (-0.519)	-2.437e+07 (-0.0296)
Year Effects	Yes	Yes	Yes	Yes	Yes
Constant	-4.019e+09*** (-8.776)	-1.047e+09*** (-7.038)	-5.099e+09*** (-7.136)	-3.926e+09*** (-6.172)	-1.077e+10** (-2.584)
Observations	2,350	806	1,544	1,398	146
R-squared	0.054	0.077	0.067	0.070	0.094
F Value	23.15	11.7	18.78	17.53	2.62

Note: t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note:

- Execomgap is total cash compensation gap (between actual level and market determined level) of all top executives in the firm. Unit is CNY.
- lnsize denotes firm size which is natural logarithm of firm's total assets.
- Companyage is Natural log of total years since firm IPO
- EXESHARE denotes executives' ownership, calculated as: (Management ownership)/(Total ownership)
- SHARECON denotes firm's ownership concentration percentage, defined as: (Ownership of the largest shareholder)/(Total ownership) *100%
- IDRATIO is ratio of firm's independent directors, defined as: (Num. of independent directors)/(Num. of all directors)
- CEODUAL is dummy variable of whether CEO and Chairman is the same person in a firm

This table presents the results of the regressions to verify relation between firm's inefficient investment and executive compensation gap based on fixed effects estimations predicating executive compensation level and firm's investment level. The table reports results of five regressions. The first regression is run on all firms; the second regression is run on all non-SOEs; the third regression is run on all SOEs; the fourth regression is run on all local SOEs and the last regression is run on all central SOEs.

Chapter 5. Conclusions

5.1 Findings summary

This thesis studies the correlation between firms' investment behavior and executive compensation in publicly listed companies that offer Chinese A shares. The thesis argues that because the Chinese government regulates executive compensation in SOEs, executive compensation in those firms will be lower than it if was solely determined by the market. Furthermore, because there are serious agency problems in Chinese SOEs, the gap between the higher market-determined compensation level and the lower actual compensation level will cause inefficient investments that allow SOE executives to acquire personal benefits and offset the loss caused by the compensation gap.

The first part of this thesis investigates whether executive compensation in Chinese SOEs is depressed by implicit or explicit government regulations. To begin the study, the thesis first constructs a market-oriented model to measure expected executive compensation levels by considering firm size, industry, corporate governance, and relevant accounting indices. This thesis then predicts the market-determined compensation level for each company based on the model and calculates the difference between the market-determined compensation level and the executive's actual compensation level.

The second part of this thesis focuses on investigating firm investments. The thesis divides firm investments into two parts (Richardson, 2006). The first part is reasonable investment, which includes investments that not only support existing assets and future growth opportunities but also have an NPV greater than zero. The second part, which cannot be explained by existing assets and growth opportunities, is inefficient investment. Following this logic, the thesis obtains the difference between a firm's actual investments and its predictable investments, a value that denotes a

firm's inefficient investments. As mentioned in previous chapters, the sign of this difference indicates whether a firm is under- or overinvested. The absolute value of this difference indicates the degree of a firm's inefficient investments.

The third part of this thesis studies the correlation between the executive compensation gap and a firm's inefficient investments. This thesis conducts the study in various sample sets including SOEs, central SOEs, local SOEs, and non-SOEs to verify the rigor of the research.

Some key findings have been obtained in these studies. They are highlighted as below.

In the first part, this thesis finds that firm size is the most important factor in setting executive compensation. ROA is positively but not significantly related to executive compensation in all firms. However, gross margin is significantly and positively related to executive compensation. This finding shows that to some degree, firm performance influences compensation decisions; that said, short-term measures (e.g., gross margins) play a more important role than relatively long-term measures (e.g., ROA) in setting compensation. Corporate governance remains weak in listed Chinese companies. Independent directors are not effectively playing their monitoring role in all firms, and CEO duality remains prevalent, which not only influences executive compensation decisions but also causes higher compensation generally. Ownership structure has a significant impact on executive compensation. Consistent with substitute effect theory, the result shows a negative relation between management ownership and executive compensation, supporting the argument that management ownership has a substitutive effect on compensation thus the management may accept relatively lower cash compensation. This finding is consistent with some previous studies (e.g., Cordeiro and Veliyath, 2003; Hu et al., 2012) but not with other studies (e.g., Sanders, 2001a; Peng 2006; Zhang, 2010) whose findings support the agency theory and argue that management ownership helps managers influence compensation

decisions more effectively so that managers with higher ownership will receive higher compensation. However such relation is not significant in this research which may be because management ownership in Chinese listed companies is not prevalent yet. According to this study and the findings of other authors (e.g., Ke and Qiu, 2009; Conyon and He, 2011; Zhou, 2013), ownership concentration is significantly and negatively related to executive compensation. Block holders in listed Chinese companies play an effective role in monitoring management and controlling executive cash compensation. Another important finding of the first part is the relation between SOE attribute and executive compensation. The thesis finds that SOE attribute (whether central or local) will increase the gap between an executive's actual compensation and his or her market-determined compensation level. This finding supports the hypothesis that compensation regulation occurs in listed SOEs and drives executive compensation lower than the market level.

In the second part of this thesis, the thesis investigated firms' investment behavior. Consistent with agency theory, the thesis finds that ownership concentration is negatively related to unexpected investments. This result reflects how major shareholders play an effective role in controlling and monitoring management in listed Chinese companies. A firm's business operational margin is also shown to have a positive influence on its investment level. This result is consistent with the financing constraint hypothesis, which holds that if a firm has a higher operational margin and thus more disposable funds, it is more likely to engage in additional investment if other conditions remain the same. As in Richardson's (2006) research, this thesis finds that overinvestment is more likely to occur in firms with positive free cash flow. This result also supports the financing constraint hypothesis. Firms' SOE attribute is significantly and positively related to their unexpected investments, thus indicating that with other conditions remaining the same, SOEs will invest more than non-SOEs. The thesis also finds that local SOEs engage in more unexpected investment than other firms.

This thesis also finds, in the second part of the thesis, that for all of the sampled companies, a firm's investment opportunities, cash flow, sales revenue, amount of cash stock, and size are positively related to its annual investment increase, but its debt rate (lever) has a negative relation to its annual investment increase. The sign of the coefficient of interaction, $\text{Cashflow} \times Q$, is negative and significant at the 1% level, which indicates that listed Chinese companies are generally overinvested. For all SOE samples, the abovementioned correlations remain the same, and the coefficient of QCFK remains negative and strongly significant at 1%. This result reveals that Chinese listed SOEs are generally overinvested. The thesis finds strong evidence in this study that local SOEs are overinvested, but the thesis does not find sufficient evidence to support the same conclusion for central SOEs.

The correlation between compensation regulation and a firm's inefficient investments is studied in the third part of this thesis. The thesis finds a significant and positive relation between the extent of compensation regulation and degree of a listed Chinese SOE's overinvestment. For non-overinvested SOEs, executive compensation regulations will also increase a firm's investments. A similar correlation between compensation and a firm's investment behavior is found in both central and local SOEs. In general, this part's findings support the argument that the regulation of executive compensation leads to overinvestment in Chinese listed SOEs. For all non-SOEs, this thesis finds that when firms are overinvested, the relation between the compensation gap and unexpected investments is negative; when firms are underinvested, the relation between the compensation gap and unexpected investments is positive. The different findings for SOEs and non-SOEs reveal that the agency problem caused by compensation regulation in SOEs is overinvestment, whereas the problem in non-SOEs is underinvestment. The implications of these findings are that when executives in SOEs find that their incomes are lower than the market level, they make overinvestments to serve their own interests. When executives in non-SOEs believe that their incomes are lower than the market level, they shirk to conserve their personal efforts.

In summary, this thesis's findings support the hypothesis. First, there is compensation regulation in listed SOEs, which results in actual executive compensation that is lower than the market-determined level. Second, there is overinvestment in Chinese listed SOEs. Third, executive compensation regulations in Chinese listed SOEs lead to general overinvestment by these companies.

5.2 Research Contributions

This study contributes to the current literature related to compensation management and firms' investment behaviors. This research also provides a good reference for business administration practitioners and authorities designing executive compensation schemes.

The thesis introduces a new method to study the correlation between executive compensation and firm investment behaviors. In the study, the thesis first builds a quantitative model to describe the gap between actual executive compensation and market-determined compensation. Second, the thesis calculates the gap between the two as the measurement of the degree of compensation regulation. Third, the thesis obtains the difference between a firm's actual investment level and its normal investment level, which is the measurement of a firm's inefficient investment. Finally, this thesis checks the correlation between the two gaps mentioned above, finding a significant and positive correlation. This method contributes to the literature on corporate governance and firm investment. Although there have been some related studies on either executive compensation or firm investment, this is the first thesis to link executive compensation and firm investment from a compensation regulation perspective in the recent Chinese political and economic context. Furthermore, this thesis introduces a dynamic panel data model to calculate an executive's market-determined compensation level, an innovation that is novel in the literature.

This thesis provides strong quantitative evidence that executive compensation in

Chinese listed SOEs is lower than market-determined levels because of government regulations. Many literatures argue that executive compensations in Chinese listed companies, especially Chinese listed state owned enterprises, are high because of poor corporate governance, government intervene or company ownership structure (e.g.: Shi,2010; Jiang,2008; Shen and Li,2010; Yang and Zhao,2012). Although these arguments reveal some problems in executive compensation of Chinese listed companies, they are not the key. Since unique ownership of Chinese public listed companies, especially listed SOEs, there are severe agency problems between executives of Chinese listed SOEs and SOEs' administrative authorities in the government. Due to asymmetrical information, it is very difficult for government to judge executives' behavior, meanwhile, although SOEs introduced independent directors, they are not real "independent" (e.g. Tang et al., 2005; Gao et al., 2006) to monitor executives including compensation setting. Thus to keep a "fair" compensation for executives in SOEs, government merely issued many "Pay ceiling order" and all kinds of regulations. This study, however, shows that underpayment is prevailing among Chinese listed companies, particularly listed SOEs. The study finds that almost half of executives in Chinese listed SOEs are underpaid when use all listed companies as the benchmark of market compensation level, this number is even higher when use all non-SOEs as the same benchmark. This finding is valuable. It clearly shows that although some executives are overpaid in SOEs, many more are underpaid. So scholars and administrative authorities should focus more on how to motivate executives in Chinese listed SOEs rather than merely regulate executives' compensation to cater to public's appeal of fairness and justice.

This thesis also finds overinvestment among Chinese listed SOEs and a strong correlation between compensation regulation and such overinvestment. Furthermore, this thesis reveals that SOEs and private firms have different agency problems. If executive compensation is lower than the market level, SOEs' resulting agency problems involve overinvestment, whereas the resulting agency problems of private

firms involve executive shirking when making investment decisions. Local SOEs are more likely to be overinvested than central SOEs. However, executives in local SOEs are more likely than executives in central SOEs to overinvest. The difference between local and central SOEs reveals that central SOEs may be subject to stricter government monitoring and management; thus, it is more difficult for central SOEs to overinvest, even if their executives wish to do so. The above findings are valuable to the academic literature. Only very few literatures studied relation between executive compensation and firm's investment (e.g.: Chen and Sun, 2014; Xia and Yu, 2012; Xin et al., 2007; Xu and Liu, 2014). However in general previous literatures haven't reached a well-accepted conclusion of relation between executive compensation and firm investment under Chinese political and economic context. This vagueness brings obstacles to innumerable previous researches and future studies as well. Almost all existing researches did not consider the impact from executive compensation when study firm's investment behavior. This thesis aims to bring more knowledge to this field by answering the relation between executive compensation and firm investment in a more quantitative and structural way. The thesis not only enriches the existing literatures about executive compensation and firm investment, it also provides strong empirical evidences to support agency theory in corporate finance field. Meanwhile, the thesis indicates that the investment models adopted by the previous literature are insufficient in that they ignore the influence of compensation incentives. Therefore, this study provides a new understanding of the investment behaviors of Chinese listed firms which will bring valuable hints to future researches in the field related to executive compensation and firm investment.

This thesis contributes to both corporate governance practitioners and policy makers. Because China has a political and economic system different from those of developed Western economies, the challenges of corporate governance in Chinese firms—especially listed SOEs—are much different from those that have been discussed in the literature. Because SOEs are nominally owned by either the state or the people, however, there is no proper organization to represent the people. Instead,

SOEs are managed by SASAC, which is a department of the Chinese government. SASAC is not an SOE's true owner, and therefore, SASAC officials do not have an adequate incentive to supervise SOE management. In such situations, the SOE's day-to-day managers possess much more information than the government, and consequently, their inside information enables them to make managerial decisions that cater to their own interests. Absentee ownership is also a prominent problem in the corporate governance of Chinese SOEs.

The implications of this thesis's findings are important for corporate governance practitioners. First, it reminds SASAC that simply controlling executive compensation in SOEs, as the Chinese government is now doing, may be the wrong decision because compared to the market level, executive compensation in SOEs is already low. Second, to motivate SOE executives, policy makers may rely more on equity-based incentives. Perhaps a proper way to motivate executives in SOEs could be to keep their cash compensation constant while increasing their equity-based compensation as a share of total compensation. Third, because most listed SOEs are ultimately controlled by the state, the state is normally the single largest shareholder. This ownership structure not only causes relatively lower executive compensation but also distorts corporate governance by resulting in a low independent-director ratio, for example. One possible way to further implement SOE reforms would be to dilute the state's ownership (Chen et al., 1998; Firth et al., 2006) such that boards of directors can truly take responsibility for shareholder interests.

This thesis's findings also provide valuable information for Chinese government policy makers. The thesis determines that compensation regulation has caused overinvestment in Chinese listed SOEs. This finding makes Chinese governmental policies on executive compensation extremely questionable. In recent years, the Chinese government has proactively controlled and regulated executive compensation in both central and local SOEs. The original purpose of these regulations was to improve SOE performance, lower costs, and eliminate unfairness because SOEs are

owned by the people and therefore executives should not receive compensation that is much higher than that of ordinary employees. However, this research finds that if authorities regulate executive compensation to below the market level, SOE executives will engage in overinvestment to offset the losses caused by those compensation regulations. Overinvestment normally involves negative-NPV projects, which devalue SOEs in the long term (e.g. Morgado and Pindado, 2003; Jiang, 2011; Du et al., 2011; Khieu et al., 2012). Because asymmetric information makes it very difficult to prevent SOE executives from overinvesting, a better way to motivate SOE executives is to offer them market-level compensation to mitigate overinvestment and increase the long-term value of the SOE. Another finding also provides policy makers with information to improve their monitoring of SOEs. This thesis shows that local SOEs are more likely than central SOEs to overinvest when executives are offered below-market compensation. In general, central SOEs are more closely monitored by the central government so that their executives cannot easily decide to overinvest. However, local SOEs are managed by local governments and conduct many economic and administrative tasks that are related to local government, including providing tax contributions and employment to the areas in which they are located. Moreover, because one key performance index of local government is GDP, the local government is motivated to encourage local SOEs to increase their size by investing in more negative-NPV projects. This thesis reminds policy makers to maintain a closer watch when monitoring local SOEs. Meanwhile, unlike what the Chinese government is currently doing to regulate executive compensation in SOEs, the thesis indicates that compensation regulations in Chinese listed SOEs bring severe side effects and will furtherly diminish state-owned assets. According to this thesis's findings, the proper way to manage SOE executives is to offer them market-level compensation and improve corporate governance by introducing major outside stakeholders, for example. This implication is critical: it may influence China government to reconsider future reform actions in Chinese SOEs and will ultimately impact China's political and economic ecology in a long term.

5.3 Research limitations and further research areas

This thesis introduces a new method to study the correlation between executive compensation and investment in Chinese SOEs. Many of its findings have been obtained from the research, and these findings are valuable to both the academic literature and SOE policymakers.

However, this research has some limitations. To measure a firm's investment opportunities the thesis uses the firm's average Tobin's Q. However, only a firm's marginal Q can reflect firm performance and operational characteristics (Hayashi, 1982). Because Chinese stock is only reaching or approaching weak effectiveness (Wu, 1996; Lan et al., 2005), the stock prices of listed Chinese firms only reflect historical information. Therefore, as an index of a firm's future investment opportunity based on stock price, average Q inevitably results in measurement errors. Although many scholars use average Q to measure a firm's investment opportunities, marginal Q is the preferable choice in future research.

In this study, the thesis only analyzed executive cash compensation because although equity-based compensation is increasing, it currently remains a small portion of total compensation. In the future, equity incentives will be an important part of the total compensation package, and researchers shall focus on them in later studies. Another possible improvement on this research would be to find a proxy for the entire market. Because of data constraints, this thesis uses all listed companies as a substitute for the entire market. The thesis also tried to use all private listed companies as a proxy. However, because listed companies have some similar features—especially under China's current IPO policy—there may be potential bias as this thesis had used all listed companies as a proxy for the entire market. The best way to manage this issue would be to rely on data from a sufficient number of listed and privately held companies. Finally, further research can more closely study the diversity between central SOEs and local SOEs, which have different attributes in this study.

In addition, in future studies, researchers may focus on central SOEs because this thesis does not find a significant relation between compensation regulation and firm overinvestment for central SOEs. It is spontaneously to believe that there is also agency problem in central SOEs, but because central SOEs are monitored by the central government, it is difficult for these executives to overinvest. In contrast, local SOEs assume both economic and political responsibilities related to local government, including GDP growth and providing local job opportunities. Accordingly, the local government is more likely to tolerate overinvestment by local SOEs. This hypothesis should be verified, and it will be an interesting topic for future researches.

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